

focus

ON COMMERCIAL AVIATION SAFETY

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Front Cover: Avro RJX



Staff Recruitment and Training - Future Difficulties

All over in aviation circles the conversation turns to the lack of suitably qualified staff in the marketplace.

The reasons for this shortage of personnel vary from one area to another. Some believe that young potential candidates do not find the industry sufficiently attractive. Others argue that intelligent school leavers do not see any benefit in training to be an aircraft engineer compared with being an IT engineer.

After several years training, an aeronautical engineer would have to work outdoors in the cold and rain at all hours of the day and night. On the other hand, for the same investment of time, an IT person would work in a warm, dry environment; with better pay; quicker promotion; a wider choice of employer. Already a number of qualified electronic engineers have left the aviation industry to work in other industries for more money and better working conditions. It is likely that this trend may continue.

Over the last 30 years we have seen many airlines and maintenance organisations discontinue their apprenticeship training schemes in order to cut their operating costs. Competition for trained staff in all disciplines is increasing and will continue to do so.

More recently we have seen the downsizing of the aviation arm of the military. This has resulted in the reduction of new technical recruits. The Navy and Air Force has traditionally been a source of experienced engineers with management and leadership skills for the aviation industry. Regrettably this source no longer exists.

During World War II and for a number of years after that, apprentice training flourished. However in the 1980s those who received this training started to retire and this drained the industry of experienced engineers. This drain on experienced staff coupled with the reluctance by air operators to invest in ongoing training, has now reached a critical point.

Few training schemes have been introduced to replace these traditional sources with the result that few young school leavers are being drawn into the industry. Those few that are recruited soon compare their pay and conditions with those of their contemporaries in the IT and other industries. They become disenchanted and leave the industry.

With the number of aircraft in operation ever increasing and the decreasing number of available engineers we seem poorly placed to take advantage of the growth opportunity being presented to us.

We could continue to increase our fleet size with a reducing number of engineers at the risk of jeopardising safety. Or we could start investing in training to overcome the shortage. Most air operators will resist the latter in the hope that someone else will start to do the training in an effort to save money.

Perhaps the regulator will step in and specify the number of qualified and non-qualified staff required per aircraft in the fleet in order to ensure that the aircraft are properly maintained and that safety is not compromised. This will force the air operators to take some action.

Alternatively the airlines could contribute to a central training fund, based on their fleet size, to ensure that sufficient engineers are trained for the industry. The Royal Air Force training facilities could perhaps be geared up to cope with this task and to ensure an adequate supply of trained personnel in the event of a serious conflict.

Maybe the shortage of skilled engineers will force up their pay levels so high that the air operators will become more willing to invest in skills training. One thing that is becoming clear is that unless something is done soon to remedy the situation the opportunity for air operators to grow in line with the envisaged demand will pass them by.



Chairman's Column

A belated happy new year to one and all. With the New Year it is prudent for us to look back at the year just gone and see what we can learn to enhance safety for the coming year.

A review of jet accidents of last year indicates a very slight improvement in the jet Total Loss events (20v21), the same number of substantial Damage Accidents (30) and marginally fewer Fatal Accidents (8v10) and all this while hours flown increased by 8%, sectors by 11 1/2% and fleet size by 7% to 14,723 aircraft. Disappointingly there were three CFIT accidents, compared with one in 1999.

A turboprop review shows there were 20 operational Total Losses compared with 28 in 1999 and 13 Substantial Damage Accidents. With 12 fatal accidents compared to 17 last year and fatalities reduced from 174 to 124 the new millennium started well for the turboprop fleet, especially with just four CFIT accidents. The increase in aircraft years flown at just .64% and fleet size increasing by just .88% to 5,414 aircraft indicates the impact on the turboprop operation of the arrival of the Regional Jet aircraft.

On both fleets, jet and turboprop, Cargo Total Loss accidents accounted for 25% of accidents, showing a significantly increased exposure. The UK Flight Safety Committee, in recognition of this fact, has set up a Cargo Operations Working Group to identify where improvements might be achieved. The Working Group is presently developing a "best practice" manual which it is hoped to distribute when completed.

The work of the Committee for the year ahead is to contribute to this

improvement. The work program is set and the seminar arrangements are in train. The new format of a main meeting every two months, with an M&F meeting on the day before, appears to be working well, but only you can confirm that. Our treasurer Tony Ingham, is retiring from the CAA on the 28 February and will be a huge loss. We wish him well in retirement and look forward to meeting and working with his successor.

Thank-you all for your participation in the work of the Committee over the last year. We look forward to the year ahead with anticipation.



SHAIRSPACE 2001 - Norwich

On the 22nd February 2001 the Directorate of Air Staff organised a meeting of interested parties to try to raise the awareness and understanding of aircrews and controllers, both civil and military, operating within Class G Airspace.

More than 60 participants attended the meeting, indicating the level of interest in this the subject. The meeting was jointly chaired by Air Commodore Chris Moran, Director of Air Staff, MOD and Ed Paintin, Chief Executive UK Flight Safety Committee.

The aims of the meeting were: (a) to promote a safer operating environment for users of Class G Airspace (b) to provide a vehicle for communication between civilian and military operators (c) to increase awareness and understanding of attendees in a non-confrontational environment.

The meeting took the form of a number of very interesting presentations where different airspace users gave an account of how they use the Class G Airspace for their type of operation. Topics covered

included: Airprox Summary for the Region - Gordon Mc Robbie, Chairman UK Airprox Board; Control in Class G Airspace - Anglia Radar; Air Defence Aircraft Control Procedures - Flt. Lt Rod Boundy, RAF Neatishead; Air Defence an F-15 Cockpit View - Lt. Col. Mike Miller USAF, HQ 3rd Air Force, Mildenhall; TCAS Operations - Brian Wilcox, KLM uk; Control in Class G Airspace - Sqn Ldr Martin Lackey, Strike Command; Ground Attack a Jaguar Cockpit View - Sqn Ldr Tom Barrett, RAF Coltishall.

During the Open Forum a large number of questions were raised. These led to some very interesting discussions to the enlightenment of all.

The general consensus at the end of the evening was that the meeting had been a great success and that the objectives had been met. The organiser, Wg Cdr Guy Stockhill, RAF, Directorate of Air Staff is to be congratulated for putting together a most informative and enjoyable meeting.





Did You Know?

by Peter Martin

A number of members have expressed an interest in the restrictions on an employer's right to intercept communications on private telecoms systems. This is an attempt in a few hundred words to clarify a confusing topic.

Until very recently, there has been no specific regulation in this area so that, as long as employers complied with the Data Protection legislation and the Human Rights Act they could not be found liable for monitoring communications such as emails, faxes and telephone calls made in the workplace. But things are now very different. On 24 October 2000 there came into force the **Regulation of Investigatory Powers Act 2000** coupled with the **Telecommunications (Lawful Business Practice) (Interception of Communications) Regulations 2000**.

The Act ("RIPA") creates a new statutory tort of unlawful interception on a private telecoms system; this means, very simply, that unless a business which controls a private system has a lawful authority, it will be liable if it intercepts any communication made on or by means of that system.

To create a potential liability there must be:-

1. A "communication" in the form, in our sort of life, emails, faxes or telephone calls.
2. A "private telecoms system" attached to a public system.
3. The "communication" must be intercepted, which means that the contents of the communication must

become available to a third party to the exchange between sender and receiver. And it must happen in the UK.

4. The *interception* must be by or with the consent of the controller of the private system – usually the employer.
5. The *interception* must occur during the course of the transmission.
6. The *interception* must be made without lawful excuse or authority – as to which more later.

The Regulations permit the monitoring or recording of communications on private systems for a variety of purposes, namely:-

- A. To establish commercial facts – for example, has a contract been entered into?
- B. To ascertain compliance with regulations.
- C. To prevent or detect crime.
- D. To investigate or detect unauthorised use of the private system – for example, to detect private calls or use of the internet and so on.
- E. To ensure the effective use of the system.

I must here add that the Regulations allow monitoring (but not recording) by the controller of the system without consent where this is done to determine whether the communications are relevant to the business.

It is also important to note here that if a business wishes to take advantage of the exceptions set out in the Regulations, it must make reasonable efforts to inform

potential users that their communications may be intercepted; if this is not done, the protection of the employer may be lost.

RIPA and the regulations pose serious questions for safety officers who have in the past and wish to continue in the future to communicate "privately" with fellow employees in the context of their function. Since the role of air safety officer is very much a role which exists in the interests of the employer as well as fellow employees and passengers and the world at large, it is difficult to see how such communications as the air safety officer may have with third parties do not fall within the exceptions in favour of employers.

It is thus essential in the absence of any settled law by way of interpretation of this very new regime, that air safety officers negotiate with employers so as to ensure that their non-private communications are not monitored or recorded – or both. Consent to interception must be politely refused, if asked for. It must be further argued that communications related specifically to air safety issues, while obviously for the determination of facts relevant to the business, are of a nature which has no or no immediate commercial impact.

I suggest, but without in any way advising, that in any company in which the risk or event of interception becomes manifest, the air safety officer concerned should open the negotiations for securing privacy. If risks or events become commonplace, UKFSC will provide a standard form letter taking up the matter.

However, it is essential that any disputes be settled by negotiation as the right of action in tort is only of any real value if some damage is suffered complainant; in the case of air safety officers, it is probably not the officer who suffers but only either the employer himself or the third party employee in communication with the air safety officer who may be in some way compromised in his employment. It follows that the negotiations with the employer must cover not only one side of the communication but both – with both probably internal.

There are major issues in all this which arise under the European Convention of Human Rights and under the Data Protection Act 1998 – but things will need to get pretty bad before they arise in practice!



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Powder Keg

Ground-breaking research into drug rape - a new, complex crime which can result in a victim's death - has been released this week. Tina Orr-Munro reports on its findings and the myths it dispels.

Drug rape in Britain is becoming more prevalent than many people believe, claims the author of a Home Office report called *Drug assisted sexual assault*.

DCI Peter Sturman, who spent two years working on the report, says the general police view of drug rape, is that there is no 'specific problem' in this country. However, his findings look set to challenge that view.

'Drug rape is not in epidemic proportions, but it is happening and it should be a real concern. This is a particularly awful offence and every case is one too many,' he says.

Recent high-profile convictions for drug rape - the 'spiking' of drinks with drugs to sedate and then rape a person - have sparked concerns about the spread of this crime and its dangers following deaths of victims in some cases.

DCI Sturman of the Metropolitan Police's serious crime group, believes it is the first time research into drug rape has been done in the UK.

He admits that when he started his study he had little understanding of the problem. He says part of the driving force behind the research was to 'ascertain the facts and establish the true situation'.

Myths Exposed

Within weeks of the official launch of the research in February, 1998, the 'true situation' began to make itself known.

'Within three weeks of the press launch, 67 alleged victims of drug rape attacks had got in touch. In all I had over 120 replies', says DCI Sturman.

His initial intention was to measure the extent of drug rape in Britain, but, he says it became apparent that this approach was not going to work.

'When you consider only seven per cent of rapes are reported and this particular crime is very difficult to detect, any estimation would have been no better than guesswork. In the end, I decided it was a fruitless task,' he says.

Instead DCI Sturman decided to send a questionnaire to those who had identified themselves as drug rape victims.

The accounts that came back were checked with a clinical psychologist to ensure that they were accurate.

'Basically, the clinical psychologist was

able to say they were genuine because the details they gave could not have been imagined,' says DCI Sturman.

Once he was satisfied the accounts were authentic, he asked the victims to take part in a questionnaire. Questions on when and where they had been drugged and how the police had dealt with their complaint, formed part of the questionnaire.

DCI Sturman says the results allowed him to build what he believes is a more accurate picture of drug rape. He found that the information that he was receiving contradicted commonly held beliefs about drug rape.

'Up until that time, most of the information provided on drug rapes came from the internet, but it became clear to me that much of it was wrong,' he says.



Date Rape

Much of the misinformation, says DCI Sturman surrounded the 'date rape' drug Rohypnol (flunitrazepam).

'For a long time the media identified

Rohypnol as the only drug that was being used in date rapes. So if Rohypnol wasn't found then it couldn't be a drug rape. But my research was telling me otherwise. I knew there was a discrepancy,' he says. Through his research, DCI Sturman established that Rohypnol was not widely used in drug rapes despite media reports to the contrary.

'The fact is, although it is associated with drug rape there is no firm evidence that Rohypnol is being used to facilitate rape in England,' he says. Rohypnol, he says, is now even less likely to be used as it is manufactured as a blue tablet and gives off a blue dye when mixed with liquid.

'Although', says DCI Sturman, 'Rohypnol should not be ruled out, investigators ought to be aware of other drugs in use, in particular



GHB(gammahydroxybutyrate). 'In America, GHB is six times more prevalent than Rohypnol. There, alcohol and GBH is the most frequently used combination.

'It is available here and has been detected in at least two drug rape cases,' he says.

Although there are a wide range of drugs

available that can be used in drug rapes, as DCI Sturman says alcohol remains the 'oldest Mickey Finn in the world'. 'Because society tends to view alcohol differently than other pharmaceutical drugs, it is often ignored.

'But one way or another alcohol plays a significant role in drug rape. First, we must not discount the possibility of

alcohol being slipped into a drink in order to facilitate rape, but also, 54 per cent of complainants I surveyed were given a drug via alcohol,' he says. He argues that alcohol is more than just a vehicle for administering drugs.

'Often when a drug is added to alcohol it forms a mixture more potent than the sum of its two parts,' he says.

As well as dispelling the myth that only Rohypnol is used in drug rapes, DCI Sturman's research also allowed him to investigate the problem of retrogressive memory loss.

'There was a lot of misinformation about retrogressive memory loss. The idea that if you are given the drug at eight o'clock you can't remember anything before that time. But, the fact is, drugs do not cause retrogressive memory loss.'

He believes this has considerable implications for his investigation.

'Complainants may think that the drug was put in their drinks at the time when their memory began to deteriorate. But it may well have been administered in the drink before. This is very important evidentially as it may point to a different offender altogether,' he says.

Poor Treatment

As a result of his findings DCI Sturman issued interim advice to all forces in August 1998, just six months after he had begun his investigation. He received calls from all over the country.

After he had established what drugs were being used, DCI Sturman shifted his focus to look at how drug rapes were

being investigated by the police.

He found that the victims he surveyed were less than satisfied with the way the police responded to their complaints. Over half of those who reported their attack felt the treatment they received from the police was either poor or very poor especially if the complainant was male.

'The majority of police officers take this offence very seriously, but sadly some don't. We have come a long way in investigating sexual assaults, but we have to move forward,' says DCI Sturman.

He agrees drug rapes are extremely difficult to investigate, but that does not mean they should not be investigated.

Part of the problem, he believes, is that officers do not feel they can rely on the victim's testimony.

'Victims often appear vague or their accounts exaggerated. They may even remember "consenting" to sex. As a result there is a view that the complainant is an unreliable witness and that the investigation should be based on the assumption that they have no voice and can offer nothing, but this is entirely wrong,' says DCI Sturman.

He believes it is essential for officers to 'suspend all judgement' when investigating this type of crime. No matter how bizarre their story may seem, it has to be investigated.

He believes the job of the officers is to try and fill in 'missing time' in the witness's statement.

'A victim's account must be viewed as pieces of a jigsaw. An officer's task is to identify as many pieces as possible with a truly open mind.'

DCI Sturman says it is essential that the initial report receives 'positive action' and as much evidence as possible is collected.

Urine, blood, hair and even vomit samples need to be taken quickly.

'Samples must be taken within 96 hours of the attack, because of the speed drugs leave the system. Drugs like GHB can be broken down in the body within six hours of an attack,' he says.

A side effect of taking GHB is often vomiting. As a result, samples of vomit must also be taken, says DCI Sturman.

'As GHB occurs naturally in the body it is difficult to detect through other samples. Vomit may be the only evidence,' he adds.

'In addition,' says DCI Sturman, a hair sample should also be recovered.

'There is research going on at the moment that suggests that hair samples could be analysed to detect which drug has been taken.'

Although still in its infancy, DCI Sturman says that if the research proves successful it could revolutionise the

investigation into drug rape.

'Instead of the usual race to obtain the evidence, it would be a case of sitting back and letting the hair grow until it is ready to be analysed.'

Although samples should be taken he warns that officers should not rely on toxicology results and should continue to obtain other evidence.

While DCI Sturman hopes his advice will help officers investigate drug rapes more effectively, he believes that a radical overhaul of the way in which this crime is tackled is needed.

For him, the real way forward in investigating this type of crime is to make the whole process complaint-driven.

'Traditionally, complainants have had to report what has happened to a police station or a hospital. But the simple fact is complainants are not coming forward.'

He believes the answer lies with treatment centres where the complainant can 'report what has happened and be treated as a victim.'

DCI Sturman says investigations into drug rapes should be carried out by a 'dedicated team of sexual assault investigators.'

He admits, 'This would be a pivotal change for the police, but rape is considered the most serious offence after murder. It is important that we send the correct message to the complainants and the offender.'

A specialised team would enable the

officers, says DCI Sturman, to 'build experience and expertise and develop links with other experts.'

He knows this approach will have both training and resource implications for the service and that it is not likely to be 'well received' by senior police detectives. But, he says, 'If we replace the police chaperones with a system of complaints advocates, we could offset some of the cost.'

At present rape victims are allocated a police chaperone. DCI Sturman would like to replace them with a system of independent complaints advocates.

'The complaints advocates would be independent but supportive of the prosecution process. They would know the system and help them through the trauma. It is important that the victim decides what happens and the pace it happens at,' he says.

DCI Sturman has made over 70 recommendations on how to deal with drug rapes. 20 of these affect the police service.

He knows some of the changes he is proposing are far reaching but, he warns, they should not be 'ignored or diluted.'

'If we are going to combat the problem of drug rapes, we have to develop a more sympathetic and more appropriate response to the type of crime.'

Drug Rape Facts

The following are drug rape facts outlined in DCI Sturman's survey:

50 per cent of victims were drugged in clubs or pubs

In 54 per cent of cases drugging was facilitated by alcohol

Non-strangers committed 70 per cent of attacks

20 per cent of victims had no memory of the event

60 per cent realised what was happening but were helpless

84 per cent realised they had been attacked within a day

71 per cent of males said treatment by police was poor and 50 per cent said it was hostile.

Main Recommendations

DCI Sturman's main recommendations for the police were:

The complainant must always be believed no matter how incredible the account may appear

Where drugs such as GHB are

suspected, the Medicines Control Agency Enforcement Branch must be informed
The first possible urine sample must be obtained from the complainant, in addition to other samples which must be taken within 96 hours of the attack

Everything must be done to fill in lost time of the complainant

Do not pin all hopes on toxicology results

If the victim has taken drugs voluntarily this should be seen as supporting the complainant's account as they were not in a fit state to give consent.

Reproduced with acknowledgement to Police Review.



Mobile Lashing

A SAUDI army captain has been sentenced to 70 lashes for using a mobile telephone on a domestic flight.

It's A Bomb!

Being told that the aircraft on which you are flying has a bomb on board, or even finding such a device unannounced, must be one of the most feared experiences in the world of flying. The mind instantly focuses on the horrors of the Air India flight over the Atlantic in 1985 and Pan Am flight 103 over Lockerbie in 1988, before going numb.

The horrors are all too apparent, but preparation in the event of such an occurrence can help increase the chances of a successful outcome and the survival of all on board.

Bomb threats received by airlines, of which there are many, are normally handled at the airline's base by a team devoted to such work and the decision is made there as to whether the threat is a serious one or just a hoax. If, as fortunately rarely happens, the threat is considered to be real, the first procedure is to contact the Captain of the aircraft and inform him of the situation. The next vital step is to find the device, if the crew have not already done so.

The procedures in a serious bomb threat situation vary according to the location of the aircraft. If the aircraft is on the ground, a controlled evacuation should take place. This should entail asking all passengers to leave the aircraft as quickly as possible but via the normal route, ie, via the steps or jetty. It is vitally important that passengers take all hand luggage with them when they leave the aircraft in such a situation. This ensures that when bomb disposal experts go on-board the aircraft, they will not waste valuable time in searching through, and possibly detonating, innocent luggage. Bomb disposal teams will start at one end of the

aircraft and work through everything in their search until they find the offending device. Anything that takes their time unnecessarily en route is endangering themselves, the aircraft and the surrounding airport area.

Should the aircraft be in the air, then the situation is obviously more serious. If this is the case then it is generally decided whether the aircraft is within one hour from landing or whether it is in excess of one hour from the nearest airport.

In the event of the flight being within one hour of landing, albeit at a different airport from its intended destination, then the Captain should be advised to declare an emergency and land as quickly as possible. Following this landing, the aircraft should be swiftly evacuated but again, this should take place, where possible, through normal exits. In this situation, too, passengers should be requested to take all their hand luggage with them.

If the aircraft is in flight and is further than one hour from its nearest airport, then different procedures altogether should be followed. The first priority is to find the device.

Assuming the bomb is in the aircraft passenger cabin, rather than in the hold, the normal procedure is to ask everyone on board to identify their hand luggage, thus locating any suspect or unclaimed packages.

Once the suspect device has been located, it is usual for the ground-based airline staff to put the Captain of the aircraft directly in touch with a bomb disposal expert on the ground. The device should be studied and described to this expert.

It is important that the person who finds the device talks to the bomb disposal expert. This will almost always be a cabin attendant. Information that goes through a third party can easily be distorted and causes delays while being transferred from one to the other. It is also vital that careful study is made of the device and a sketch drawn so that the least amount of time is taken in accurately telling the bomb disposal team what the device is actually comprised of.

As much of the device should be studied and sketched as possible without disturbing it so that all involved can get a clear picture of the situation.

Once it has been officially confirmed that this is a potential explosive device, it is usual for the request to be made for the device to be moved. It should be remembered that if it is the sort of device that was to be detonated by movement or disturbance, it would have exploded by this stage from the action of passengers boarding the aircraft and from the movement of the aircraft itself during taxi and take-off. It can be reasonably



assumed that this device is on a timed mechanism and is therefore safe to be moved.

A crew member will usually be required to move the device and should do so as gently but as swiftly as possible, removing it, in one operation, to the Least Resistance Bomb Location (LRBL) of the aircraft. This varies among different aircraft types but is a location in which the device will cause the least damage if detonated, for example, a weak point in the structure of the airframe such as a door. The principle behind this is that the device will blow the door, preventing structural damage to the rest of the fuselage that could threaten the safety of the aircraft.

Once the device has been positioned at the Least Resistance Bomb Location, it should be attached as firmly as possible with anything that can be used for such a job; sticky tape, straps, elastoplast. Once secured, the device should then be surrounded by soft items that will cause the least damage should the device explode.

Again, anything that can be found for this should be used, for the depth of the packing around the suspicious object should exceed eight feet in all directions. Pillows, blankets, seat cushions and clothing are all ideal and should be packed in as tightly as possible. This soft packing should then be contained as well as possible by surrounding the whole area with curtains.

Passengers closest to the device should, if at all possible, be moved away and all passengers should be seated on their

seats with the cushions removed. Apart from using the cushions as packing, lowering passengers in the seat will help protect them from any flying debris that could be caused by a blast.

Research has shown that passengers seated only eight rows away from a device secured in the aircraft's Least Resistance Bomb Location have felt little or nothing from the blast.

The aircraft should then descend to an altitude whereby it will not suffer a decompression should a hole appear in the fuselage from an explosion. An emergency should be declared and the aircraft should divert to the nearest airport where an evacuation should take place as soon as possible after landing.

Following simple precautions such as these (and every airline will have its own detailed procedures of what to do in such a case) may not lessen the trauma of being on an aircraft with a bomb on board but warning of the device gives crew members the greatest chance of preventing a disaster that can endanger the safety of the aircraft and the lives of all on board.

Reproduced with acknowledgement to Cabin Safety Update Vol.2 n..2 1996



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11TH OCTOBER 2001

0800 – 0845	Registration	1100 – 1140	Engineers - Recruitment Selection and Training
Session Chairman - Capt. Steve Solomon, Airtours		1140 – 1200	GATCO
0900 – 0910	Opening Remarks Chairman UKFSC	1200 – 1245	Discussion
0910 – 0920	Keynote Speech Rt.Hon.The Lord Clinton-Davis PC	1245 – 1400	<i>Lunch</i>
0920 – 0940	Expansion with Safety	1400 – 1420	Safety at Airports
0940 – 1010	Regulation and Legislation - Who has the Plan? Peter Hunt - CAA-SRG	1420 – 1450	Outsourced Services
1010 – 1040	Pilot Selection and Training	1450 – 1520	Summary Peter Martin
1040 – 1100	<i>Refreshment Break</i>	1520 – 1550	Discussion
		1550	Closing Remarks Chairman UKFSC

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Registration Form and finalised Programme will be published in the June issue of FOCUS or visit our Website at www.ukfsc.co.uk.



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Lower Back Pain is a Common complaint, But Precautionary Practices Help Pilots Cope

Some ailments may be the result of poor posture, stress, lack of exercise or improper design of work space.
by Stanley R Mohler MD

Most people experience lower back pain sometime during their adult lives. In industrialized countries, more than 60 percent of the population admits to having had back pain.¹ In the United States, problems affecting the lower back are the leading cause of disability for people under age 45² and in England, back pain is the leading cause of disability for people of all ages.³

Although data are not available on flight crewmembers with lower back pain, the numbers presumably are similar to those for the general population, and several studies - primarily involving flight crewmembers on military helicopters - have attempted to gauge the frequency of back pain among pilots.

The studies have found that: Of 131 Australian military helicopter pilots responding to a 69-question survey, 16 percent reported regular back pain associated with flying, 28 percent reported "back discomfort," and 39 percent reported "occasional" back pain. Eighty-five percent of those who reported back pain while flying said that their ailment was related to flying, and almost one-third said that flying was detrimental to their health.⁴

Of 7,675 U.S. Navy flight crewmembers on helicopters and airplanes, 2.2 percent, or 171 crewmembers, were diagnosed with back problems. The most frequent diagnosis (44.4 percent) was intervertebral disk disorder, a category that includes slipped disks and degenerated disks. Other common diagnoses were dorsopathies or back diseases (25.1 percent), and curvature of the spine (15.2 percent). Flight engineers were more likely than other crewmembers

to have had diagnoses of back problems;⁵ and, In-flight back pain occurs in 13 percent of all U.S. Navy pilots. The U.S. Naval Operational Medicine Institute determined that helicopter pilots report a greater incidence of back pain than pilots of other Navy aircraft, probably because helicopter pilots are exposed more often to aircraft vibrations.⁶

"Back pain is well-known, at least in the Western world, as being a widespread problem in all people," said Claus Curdt-Christiansen, M.D, chief of the International Civil Aviation Organization Aviation Medicine Section. "Pilots [like other] ... people who are confined to a sitting position [at work] are more vulnerable [to back pain]."⁷

Don Hudson, M.D, air medical adviser for the Air Line Pilots Association, International, said that, although back pain is a relatively common complaint among airline pilots, determining the source of the pain is difficult. Back pain could be related to any number of factors, including an individual pilot's physical condition, posture and stress level, the pain is not necessarily job-related, Hudson said.⁸

"It's hard to say [that a pilot's back pain] is due to flying, as opposed to [the back pain experienced by] a doctor sitting at a desk," Hudson said.

Nevertheless, a biomechanical analysis of the dimensions of pilot seats in five types of aircraft (Airbus A310, Boeing 737, Boeing 747-300, Boeing 747-400 [B-747-400] and McDonnell Douglas DC-10) said that the seats do not meet basic biomechanical design criteria.⁹

Preventing Lower Back Pain

The following are recommendations for avoiding lower back pain:

- ✈ Exercise. A reasonable physical-conditioning program, along with flexibility exercises, will help strengthen the lower back;
- ✈ Maintain a weight that is in proportion to height;
- ✈ When lifting an object, keep the spine in a vertical position and squat near the object being lifted. Raise the object slowly, using the power of the legs - not the back - to accomplish the task. Before lifting an especially heavy object, stretch and flex the back muscles;
- ✈ When sitting, keep the spine relatively straight. Sit in a straight-backed chair that offers firm back support.
- ✈ When standing, place the feet as far apart as the shoulders. Periodically shift the weight from one foot to another;
- ✈ Sleep on a firm, flat mattress, on your side, with legs bent, and with a small pillow between the knees;
- ✈ When leaning forward, lean from the hips, not the waist, and keep the back and neck straight and,
- ✈ If pain is experienced during the lifting or some other movement, stop the activity.

- Stanley R. Mohler, M.D.

The analysis involved comparing the dimensions of the measured pilot seats with biomechanical and anthropometric standards (standards that involve the way a body moves to accomplish certain tasks and the precise measurement of various body parts). The measurements focused largely on the height and depth of seats, the height and depth of backrests and the height of lumbar supports and armrests.

The analysis said that pilot seats generally could be made more comfortable by making portions of the seats flatter, raising lumbar supports, improving the adjustability of armrests and modifying the angle at which the seats are tilted.

Nevertheless, consideration of the biomechanical requirements is not the only factor in establishing criteria for comfortable seats, said Darcy Hilby, a Boeing engineer in the ergonomics group for design of the Boeing 777 (B-777). Hilby said that standards for pilot seats and observer seats on the B-777 were developed after interviews with pilots who fly transoceanic flights in Boeing 747 - 400s. The pilots were asked how comfortable the B-747 flight-deck seats were during long flights.¹⁰

"The outcome ... was that they thought the B -747-400 seats were pretty comfortable," Hilby said.

'As a result, design standards for B-777 seats were based on the B-747 seat design, also taking into consideration the requirements established by the U.S. Federal Aviation Administration that the seats be capable of withstanding certain forces in an accident,' she said.

Ipeco Europe, which manufactured the pilot seats for the B -777, said that the seats include lumbar supports that can be adjusted vertically and horizontally: a seat-back with an adjustable degree of recline; adjustable, stowable armrests; adjustable thigh supports; horizontal, vertical and lateral seat adjustments; and adjustable headrests.¹¹

Regardless of the source of lower back pain, a number of precautionary practices, including proper exercise and proper posture can help crewmembers prevent pain (see "Preventing Lower Back Pain"). Most precautions apply to people in all professions not just to pilots, said Curdt-Christiansen and pilots often are limited in their ability to implement one of the most useful methods of fighting lower back pain - changing position by standing or by going for a walk.¹²

Diana Cronan, a spokeswoman for the Air Transport Association of America, said that many airlines have taken steps to address ergonomic issues, including recommending isometrics and other exercises that pilots can do in their seats and supplying inflatable cushions to provide additional lumbar support.¹³ Some airlines also have hired ergonomics specialists to advise pilots and other airline employees about how to perform their tasks and adjust their equipment in ways that will provide ergonomic benefits.

The back is supported by seven cervical vertebrae, 12 thoracic vertebrae, five lumbar vertebrae and five fused sacral vertebrae (Figure 1). At the lower end of the vertebral column is the coccyx, or tailbone, a unit of four small, fused vertebrae.

The lower back, or lumbar region, is the focus of postural forces when an individual stands, sits or lifts; therefore, most back problems are associated with the lower back.

Back problems can result from a single excessive-force injury or from the gradual accumulation of small injuries that

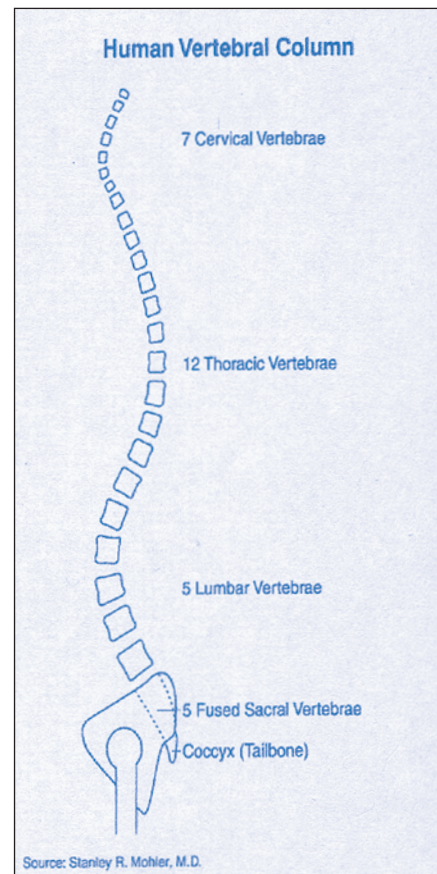


Figure 1

coalesce so that their symptoms become apparent simultaneously. In many instances, the back problems can be traced to improper methods of lifting, sitting, standing or even sleeping.

Improper lifting consists of leaning forward to pick up an object and using the back muscles to assert the primary lifting power. This strains the lower back



and presents the risk of damaging ligaments and tendons. The heavier the object being lifted and the greater the acceleration of the lifting motion, the greater the force through the back. The extra force being placed on the abdominal side of the intervertebral disks presents the risk of disk rupture to the rear. Proper lifting involves keeping the spine in a vertical position and squatting near the object, keeping the object close to the body and raising it by using the power of the legs. The possibility of injury can be minimized by spending a few minutes stretching, flexing and extending the back before lifting a heavy object.

Improper sitting - for example, slouching in a chair - puts bending forces on the front of the lower spine. Proper sitting involves maintaining a posture that assures a relatively straight spine. Proper sitting at a workstation - or on the flight deck involves having aircraft controls, instruments and

the general layout of the work area, including the seating structure, comfortably arranged for the individual operator.

The proper posture for standing involves placing the feet as far apart as the shoulders and periodically shifting the weight from one foot to another.

Improper reclining or sleeping positions place extra force on the lower back, and the problem is aggravated by

sleeping on a mattress that is too hard or too soft. The bed should be relatively firm but should yield somewhat to the body.

Among pilots, back pain typically is experienced first as a dull ache in the lower back. The pain can increase in intensity if the pilot continues flying, and sometimes pain spreads to the thoracic vertebrae, the shoulders and the neck.

Although in many medical cases the causes of back pain cannot be determined, reports of lower back pain among New York Airways helicopter pilots were traced to the arrangement of the cockpit in their Piasecki helicopters.¹⁴

The helicopters originally were designed as single-pilot military aircraft and later modified for civilian use by installing two seats.

In 1968, six of the 12 pilots who flew the helicopters filed for medical disability because of back problems; some of the other six pilots also had experienced back pain. Observations of their flights revealed that anti-torque pedals for the two flight crewmembers were offset toward the midline of the cockpit so that the pilots had to turn their bodies to operate the pedals. The twisting force on the spine was aggravated by other movements needed to operate the cyclic and the collective. Additional forces were imposed by undamped vibrations through the cockpit seats.

Because of flight schedules that involved shuttling airline passengers among the three airports serving metropolitan New York, New York, U.S. amid a New York office building owned by Pan American World Airways crewmembers typically conducted several takeoffs and landings every hour, and they had little opportunity during the workday to leave the cockpit to stretch their back muscles or to exercise in any other meaningful way.

The problems were corrected by the introduction of new equipment - helicopters with anti-torque pedals centered in front of each pilot and with a decreased level of seat vibration. Within weeks, the ailing pilots had stopped experiencing back pain.

In recent years airlines have become increasingly responsive to ergonomic issues, said Herbert R Meyer, senior technical officer at the International Federation of Air Line Pilots' Associations (IFALPA).¹⁵

IFALPA adopted a policy in 1996 recommending that all flight-deck seats

be designed “to support the body of the pilot in all ergonomically desirable ways.”

discomfort and lower back pain during middle-range flights and long-range flights but did not identify the cause of the discomfort.¹⁶

Poor nutrition - Insufficient minerals in the diet can result in loss of calcium from the bones and can lead to skeletal injuries:

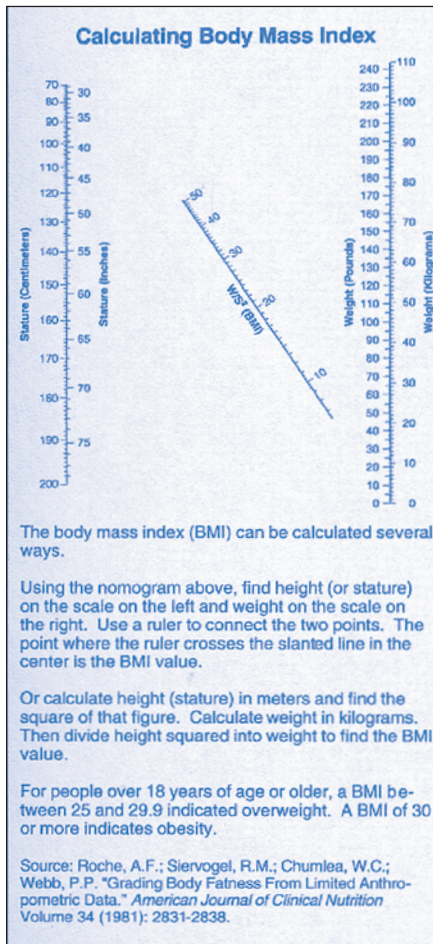


Figure 2

“Seats should be designed so as to permit full freedom of movement, in order for the pilot to perform the duties and functions in a satisfactory manner” the policy said. “Seat materials should be designed to ensure the pilot’s health and comfort, to reduce fatigue and to minimize vibration transmission.”

Besides the 1968 incident of back pain experienced by the New York Airways helicopter pilots, a 1994 study of flight-deck seating for Qantas Airways flight crews cited pilots’ complaints of

The study compared the areas of pain and discomfort identified by the Qantas pilots and said that the problem was a result of the failure of flight-deck seats to meet the biomechanical requirements of the lower back.

Proper ergonomic design is not, in itself, the answer to all pilot back problems said Curt Graeber, Boeing’s chief engineer for human factors.¹⁷

“There are a lot of variables in how people sit on flight decks,” Graeber said.

An individual pilot’s posture - and whether he or she uses the equipment in the manner intended to receive the benefits of its ergonomic design - is one of those variables, Graeber said.

Other factors that can contribute to lower back pain include:

Lack of physical conditioning - Poor muscle tone: weak ligaments and tendons: and a lack of joint, limb and back flexibility increase the chances of back injury and of the development of chronic discomfort:

Obesity - Excessive abdominal fat tends to place chronic forces on the lower back. Ideally an individual’s weight and body mass index (a formula that calculates the relationship between a person’s height and weight) should be within the range recommended by standard health charts

Chronic cough - Chronic impulsive coughing which sometimes also characterizes smokers, places repeated sharp stresses on the lower spine that can magnify other stresses and lead to back disease;

Alcohol abuse - Ethyl alcohol has adverse toxic effects on muscle and nerve tissues. Decreased coordination, coupled with the toxic effects on body tissues, can lead to overstressed back muscles. Alcohol also is associated with falls, which can lead to back injuries, and with impaired reasoning, which can lead to unwise decisions to undertake physically stressful lifting;

Variations in leg length - If an individual has significant asymmetry between the left leg and right leg, a pelvic side tilt can result, leading to lower back pain. Use of a simple, properly sized heel wedge or foot wedge inside the shoe on the foot of the shorter leg often can alleviate back discomfort;

Osteoarthritis - Repeated injury to cartilage, the material that lines bone joint surfaces, gradually fragments the cartilage and results in osteoarthritis which causes pain when joints are moved. Osteoarthritis can be prevented by warm-up and flexibility exercises, which spread lubricating fluid across the joint cartilage surfaces, minimizing the friction of movement and subsequent injury.

Rheumatoid spondylitis and ankylosing spondylitis - An inflammation of the joints between the vertebrae or between the spine and the pelvis, most often inherited, eventually causes the affected vertebrae to fuse. Proper treatment helps prevent progression of the disease.

Degenerated vertebral disk - A shock-absorbing material between the disks helps spread the load that is placed on the spine and helps absorb biomechanical shocks. The disks contain living cells, and daily activities pump nutrients into the disks and waste materials out of them. Inadequate exercise is unhealthy for the disk material and may promote degenerative changes in disks, including arthritic changes in the spine. Excessive bending or contortion can cause dislocation of a disk, producing pain and possibly resulting in the need for surgery or other treatment. Because the disk material and other spinal components are not subject to compression while a person is sleeping, an individual's height generally is 0.75 inch (1.9 centimeters) more in the morning than at night. Daily activities tend

to compress the upright spine, slowly decreasing an individual's height: and.

Osteoporosis - Poor nutrition, lack of exercise, a deficiency of calcium and certain hormonal factors may lead to a weakening of bone density known as osteoporosis. Pursuing an active, healthy lifestyle and obtaining a bone-density screening if back pain develops may determine if osteoporosis is present and whether countermeasures are required.

Lower back pain is a common complaint, during some stage of their adult lives, for most people. including pilots.

Nevertheless, precautionary practices can help flight crewmembers and others prevent pain or reduce its intensity or its frequency.

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About the Author

Stanley R. Mohler, M.D., is a professor, vice chairman and director of aerospace medicine at Wright State University School of Medicine in Dayton, Ohio, U.S.

Mohler, who holds an airline transport pilot certificate and a flight instructor certificate, was director of the U.S. Federal Aviation Agency's Civil Aviation Medicine Research Institute (now the U.S. Federal Aviation Administration's Civil Aeromedical Institute) for five years and chief of the Aeromedical Applications Division, in Washington, D.C., U.S., for 13 years.

Mohler received the 1998 Flight Safety Foundation Cecil A. Brownlow Publication Award for journalism that enhances aviation safety awareness.

Further Reading From FSF Publications

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This article is reprinted with acknowledgement to Flight Safety Foundation's May-June 2000 issue of Human Factors & Aviation Medicine.



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Quick Guide to the Law - For Pilots

The following “quick guide” advice is provided for pilots of UK registered aircraft who have problems with:

Disruptive Passengers

Prevention - the overall aim is to PREVENT disruption. People who are disorderly and/or drunk when boarding an aircraft are a “risk”. It is your decision how effectively you manage the risk.

Most airlines have “Disruptive Passenger Protocols” organised with the police. The following is extracted from such a protocol.

Inbound Flights

To assist the UK police in providing the correct response to an incident, the following information should, where possible, be obtained and forwarded to the police at the time of your first request for assistance:

- What is the precise nature of the incident, including any injuries which may have been sustained?
- What is the name and seat number of the offender(s)?
- What action has been taken by crew members, or other assistance given by passengers?
- What are the details of all crew and passengers involved?
- Who is the principal witness? (If not

interviewed immediately they should be made available at a later time for the purpose of obtaining statements of evidence. In the event of a witness not being available for a court case, due to travelling distance to the court [i.e. they live outside the UK], then provision can be made for the statement made by that witness to be admissible in evidence (under Section 23, Criminal Justice Act 1988). You should therefore be aware that a witness does not always have to attend court in person).

- **Advise your crew members who witnessed the incident to make an immediate written record of the circumstances including words that were said, and what people were seen to do (diagrams can also be used). Accurate “original notes” are very useful for a successful prosecution.**

Outbound Flights

You can still instigate action against an individual who is disruptive on a flight outbound from the UK:

- Get all details as for an inbound flight (see above);
- You have an option to report the matter to the police at the destination airport, or to send a report later to the police at the UK airport from which you departed - your decision will be dependent upon seriousness of the circumstances, urgency and company policy.
- Upon return of the aircraft to the UK,

all details should be passed to the UK police who will then make the necessary arrangements to meet and interview the offender(s) upon their return to the UK. This will allow the police to obtain statements of evidence from crew members involved without adverse disruption to their schedules.

All the criminal offences which can take place on the ground in public places can take place on your aircraft. These include:

Murder, assault, rape, sexual assault, arson, criminal damage, theft, robbery, and a wide variety of public order offences such as affray, threatening and abusive words and behaviour, conduct causing harassment distress and alarm, etc.

Your passengers can be victims of these crimes as much as you, your crew, and your airline. Bear in mind that if you or your staff do not report the matters listed above to the police, the passengers who are victims almost certainly will.

More usually you will be concerned with the following offences which are for the protection and safety of you, your crew, your passengers and your aircraft.

The really serious “inflight” offences are fortunately extremely rare - they include hijacking, and damaging or endangering an aircraft with intent to do so (plus a number of other offences under the Aviation Security Act 1982). “In flight”, under this Act means any period from the moment when all **external doors are closed** following embarkation, until the moment when any such **doors are opened** for disembarkation.

The more usual offences include those under the Air Navigation Order 1995. For this Act "Inflight" means from the moment when after the embarkation of its crew for the purpose of tasking off, the aircraft first moves under its own power, until the moment when it comes to rest after landing. The offences include:

- **Endangering the safety of an aircraft and persons therein** - A person shall not recklessly OR negligently act in a manner likely to endanger an aircraft OR any person therein, Article 55 Air Navigation Order, 1995.
- **Drunkenness in aircraft** - A person shall not enter any aircraft when drunk OR be drunk in any aircraft. Article 57(1) Air Navigation Order, 1995.
- **Drunkenness in aircraft by CREW** - A person shall not when acting as a member of the crew of any aircraft, OR being carried in any aircraft for the purpose of so acting, be under the influence of drink, OR a drug to such an extent as to impair his capacity so to act. Article 57(2) Air Navigation Order, 1995.
- **Smoking in an aircraft** - A person shall not smoke in any compartment of an aircraft registered in the UK at a time when smoking is prohibited in that compartment by a notice to that effect exhibited by or on behalf of the commander of the aircraft. Article 58(2) Air Navigation Order, 1995.
- **Duty to obey commands of aircraft commander** - It is an offence for a

person in an aircraft registered in the UK to disobey all lawful commands which the commander of that aircraft may give for the purpose of securing the safety of the aircraft and of persons OR property carried therein OR the safety, efficiency or regularity of air navigation. Article 59 Air Navigation Order, 1995.

- **Acting in a disruptive manner** - No person shall while in an aircraft:

(a) use any threatening, abusive or insulting words towards a member of the crew of the aircraft;

(b) behave in a threatening, abusive, insulting or disorderly manner towards a member of the crew of the aircraft;

(c) intentionally interfere with the performance by a member of the crew of the aircraft of his duties. Article 59A Air Navigation Order (5th Amendment), 1999.

- **Stowaways** - A person shall not secrete himself for the purpose of being carried in an aircraft without the consent of either the operator OR commander OR any other person entitled to give consent to his being carried in the aircraft. Article 60 Air Navigation Order, 1995.
- **Restraint of disruptive passengers** - Where the commander of an aircraft "in flight" has reasonable grounds; any person on board has done OR is about to do any act which may jeopardise the safety of aircraft,

passengers, property, good order, discipline (not political, racial, religious discrimination) he may take reasonable measures including restraint (provided the person is released on landing AND appropriate authorities are notified). Section 94 Civil Aviation Act, 1982.

DO NOT FORGET

If you believe it is illegal it probably is.

Get your crew to gather the evidence and the police/Crown Prosecution Service will decide the actual offence for which someone is prosecuted.

What has been done?

What has been said?

Who did and said what?

This reference supplied by the Greater Manchester Police.



Disruptive Passenger Strategy 2000



The Greater Manchester Police strategy for dealing with disruptive passengers is:

Prevention - which includes all aspects which can be tackled within an airport and onboard an aircraft.

Information - which includes the collection and analysis of data about incidents (not only about those dealt with by the Courts).

Enforcement - which includes action taken by airlines, the police, the Civil Aviation Authority, airport authorities, and commercial businesses.

The Greater Manchester Police emphasise **PREVENTION**.

Prevention

We have put the following preventative measures in place:

1. We seek continued support from staff at all bars and retail outlets.

Advisory notices have been placed warning customers about the consequences of being drunk and intending to board an aircraft.

Licensees have been asked to remind their staff to use discretion and to recognise that drinking and boisterous behaviour are for some people a large part of enjoying a holiday but that the behaviour can become illegal in certain circumstances.

Licensees have been asked to inform their staff that they can contact the police control room on ext 5555 when they believe "problems are brewing" - rather than waiting for something to actually happen. We will respond with a police presence.

Licensees have been asked to remind all their bar staff of their obligations under the Licensing Act to refuse to serve people who are drunk.

Licensees have been asked to inform GMP of the dates and times when they

perceive the greatest difficulties so that we may arrange a police presence.

2. We seek the support of Airlines and Handling Agents:

Airlines have been asked to inform us of the dates, days and/or times of flights which are likely to cause some difficulties, so that we may arrange a police presence.

Airlines have been asked to remind their staff - particularly Gate Staff - that they may contact the police control room on ext 5555 to ask for a police presence when they need support in dealing with, or advising passengers, who are either drunk or acting in an inappropriate manner.

Airlines have been asked to remind their staff about the Disruptive Passenger Protocol and the obligations of their staff to refuse to carry passengers who are drunk.

Airlines have been asked to remind their staff to exercise appropriate caution in serving people too much intoxicating drink inflight.

3. For our part the Greater Manchester Police will:

Respond promptly to calls for assistance and support from service partners.

Provide additional staff when key times, dates, days and locations have been identified as potentially difficult.

Use discretion and recognise that drinking and boisterous behaviour are for some people a large part of enjoying a holiday. A balance is struck between what is appropriate, inappropriate and also illegal behaviour.

Target particularly problematic passengers (and those travelling with them) to advise them of the consequences of drunken and disorderly behaviour - especially inflight. In the first instance passengers targeted in this way will receive a written warning form. If their behaviour warrants/attracts further police attention then their details will be given to Gate Staff so they are aware of the identity of people who may wish to satisfy themselves that the passenger(s) are fit to board the aircraft.

Record every reported* instance of disruptive behaviour landside, airside and inflight to provide information for subsequent analysis.

Gather data on incidents reported to the

police and analyse the information to provide a greater insight into the problem and to develop more effective and targeted police responses.

(*reported to the police).

Information

The GMP gather data on all instances of disruptive behaviour landside, airside and inflight, to provide information for subsequent analysis (see Appendix B). Analysis of the data is made available to service partners.

Enforcement

The GMP use a variety of methods to respond to disruptive passengers. The methods include:

- Physical uniform presence in the vicinity
- Verbal advice

- Warning notice
- Final Warning and advice to Gate Staff
- Arrest

All police staff are aware of our priorities in respect of this subdivisional objective and the contents of the Disruptive Passenger Protocol. All police officers use their discretion when deciding upon the appropriate response to reports of disruptive passengers.



An award should go to the United Airlines gate agent in Denver for being smart and funny, and making the point, when confronted by a passenger who probably deserved to fly as cargo.

A crowded United flight was cancelled, and a single agent was rebooking a long line of inconvenienced travellers.

Suddenly, an angry passenger pushed his way to the desk. He slapped his ticket down on the counter and said, "I HAVE to be on

this flight and it has to be FIRST CLASS!"

The agent replied "I'm sorry sir, I'll be happy to try to help you, but I've got to help these folks first, and I'm sure we'll be able to work something out".

The passenger was unimpressed. He asked loudly, so that the passengers behind him could hear, "Do you have any idea who I am?"

Without hesitating, the gate agent smiled and grabbed her public address microphone. "May I have

your attention please?" she began, her voice bellowing throughout the terminal. "We have a passenger here at the gate WHO DOES NOT KNOW WHO HE IS. If anyone can help him find his identity, please come to the gate".

With the folks behind him in line laughing hysterically, the man glared at the United agent, gritted his teeth and swore **** you! Without flinching, she smiled and said, "I'm sorry sir, but you'll have to stand in line for that, too".

Special Objective Check on Air Operators' Fuel Planning Policies - Summer 2000

by Captain Tim Sindall

Introduction

A Special Objective Check (SOC) on UK air operators' fuel planning policies was carried out in the Summer of 2000. The aim was to determine how operators had based their policies upon the requirements prescribed in Joint Aviation Requirements - Operations 1 (JAR-OPS 1) and how they had presented the information in company computer-generated pilot navigation logs. Fourteen operators' policies were reviewed and compared against the same aeroplane types. The SOC also asked questions which reflected concerns raised in letters to the Confidential Human Factors Incident Reporting Programme (CHIRP).

JAR-OPS 1

The text of JAR-OPS 1.255 prescribes the basic elements of an operator's fuel planning policy. Further guidance for use by operators in drafting their policies is contained in related Acceptable Means of Compliance (AMC) and Interpretative and Explanatory Material (IEM). Together, these documents reflect the text of ICAO Annex 6 Part I paragraph 4.3.6.1, which is:

"All aeroplanes. A flight shall not be commenced unless, taking into account both the meteorological conditions and any delays that are expected in flight, the aeroplane carries sufficient fuel and oil to ensure that it can safely complete the flight. In addition, a reserve shall be carried to provide for contingencies."

The Civil Aviation Authority (CAA) expects operators to apply JAR-OPS AMC and IEM guidelines unless alternative procedures intended to provide an equivalent level of safety are acceptable

to the Authority. This is no different from when Civil Air Publication (CAP) 360 Part 1 was used by the Flight Operations Department (FOD) as the standard by which all operators' fuel policies were to be specified. In practice, very few operators have sought to differ from implementing first CAP 360 and then AMC/IEM guidelines in their operations manuals.

The basic elements of a fuel planning policy published in JAR-OPS 1 for normal flights are:

A Taxy Fuel This is the total amount of fuel expected to be used prior to take off. Local conditions at the departure airfield and APU consumption should be taken into account.

B Trip Fuel This should include: Fuel for take-off and climb from aerodrome elevation to the initial cruising level/altitude, taking into account the expected departure routing; Fuel from top of climb to top of descent, including any step climb/descent; Fuel from top of descent to the point where the approach is initiated, taking into account the expected arrival procedure; and, Fuel for approach and landing at the destination aerodrome.

C Reserve Fuel This should include: *Contingency Fuel* Because at the planning stage, not all factors which could have an influence on the fuel consumption to the destination aerodrome can be foreseen, Contingency Fuel is carried to compensate for items such as: Deviations of an individual aeroplane from the expected fuel consumption data;



Deviations from forecast meteorological conditions; and, Deviations from planned routings and/or cruising levels/altitudes.

Alternate Fuel This should be carried only if a destination alternate is required;

Final Reserve Fuel For aeroplanes with turbine power units, fuel to fly for 30 minutes at holding speed at 1500 ft above the aerodrome elevation in normal conditions; and,

Additional Fuel This should be carried only if required by the type of operations, (eg ETOPS);

D Extra Fuel This should be carried only if required by the aircraft commander.

Results

Data from the questionnaires was entered into four Tables, each of which matched the four aspects described above. Arranged vertically, each pair of types surveyed (four in the case of the B737s) were placed adjacent to one another to facilitate visual inspection of the results. One 'block' of aeroplane types contained the short- and medium-haul types (B757, A320, B737, and BAe 146), the other the long-haul types (B747-400, B747-200 and A330).

Analysis

Horizontal and Vertical Climb Profiles, and Contingency Fuel Amounts

The results of this SOC showed that all computer-generated plogs but one failed to take full account of the actual departure and arrival routings in Trip Fuel calculations. This begs the question as to whether these inaccuracies could be significant in terms of fuel burn not accounted for, and whether provision is made to ensure that corrections to Trip Fuel amounts will be made before the total fuel required is determined.

Unless the computer program either reflects which STAR is expected to be used (as three did) or contains a default that assumes that the longest STAR will be used (as six did), the Trip Fuel may be inaccurate. Where such inaccuracies are known to be inherent in the computer program and no adjustment is made by the aircraft commander or dispatcher to adjust the amount of Trip Fuel required, then Reserve Fuel may - but should not - have to be relied upon to make up for any deficiency.

However, it is reasonable to expect an aircraft commander or dispatcher to know at the planning stage which runway and associated SID are likely to be used on departure and - if the computer program does not include this in its calculations - he should be at liberty to increase (or, possibly, to reduce) the Trip Fuel accordingly. (Seven of the plogs reflected the expected or 'longest' departure routings, and three reflected the 'most used'.)

The significance of failure to make adequate provision for extended routings can be illustrated by comparing the amount of Contingency Fuel carried by a typical short-haul operator, based upon the greater of 5% of Trip Fuel or a specified minimum, (and which equates to about 5 minutes), with the additional time spent in the cruise following departure from a runway orientated in the opposite direction to that of the flight plan routing (about 4 minutes). Of course, both times can vary considerably, but unless the commander increases the Trip Fuel required by the equivalent of 4 minutes, his aircraft will have burnt 80% of the Contingency Fuel by the time it passes abeam the departure runway on the SID routing. Reliance should not be placed upon the use of Contingency Fuel for this purpose since the additional track miles to be flown/time in the air and the associated fuel burn are almost certainly foreseeable. Contingency Fuel should be carried only for unforeseen circumstances.

Recommendation 1 Operators should review their fuel policies to ensure that, if their computer fuel planning programs do not take proper account

of the runways and their associated SIDs and STARs which are likely to be used 'on the day', commanders or dispatchers are required to consider adjusting Trip Fuel amounts so as to rectify any deficiencies. Preferably, operators should change their computer fuel planning programs to remove or to reduce to negligible proportions all such inaccuracies where these might lead to inadequate amounts of Trip Fuel being calculated.

Unusable and Unavailable Fuel, and the Declaration of an Emergency

In researching the extent to which fuel quantity indicating systems might mislead flight crews by including unusable and unavailable fuel in the amounts displayed, the SOC revealed that for most aeroplane types surveyed this concern was unfounded. These systems displayed either only the fuel that could be used or fuel that was less than actually remained. 'Unusable' in this context should be taken to mean fuel that cannot reach the engine due to tank and fuel line design, and 'unavailable' means that the fuel indicating system over-reads.





However, for two B737 operators, unusable fuel amounts of 68 and 72 kg were recorded, equating to less than two minutes time in the air. This, it is suggested, would not be significant when compared with the associated fuel levels at which the aircraft should have landed (Final Reserve Fuel - about 1200 kg) preceded by the declaration of an emergency.

No unavailable fuel amounts were declared - for the reasons stated above.

Requests for a Priority Approach, Declaration of an Emergency, and Typical Holding/Final Reserve Fuel Amounts
All operators except two (B757 and A330) used Final Reserve Fuel (30 minutes at 1500 ft) as a value associated with the declaration of an emergency. One of the two who did not conform with this formula used a value that equated to about 37 minutes and the other a value that equated to about 25 minutes. One operator of B747-400 and B747-200 aeroplanes specified that a Priority Approach was to be requested when it seemed likely that the aeroplane would land with less than Final Reserve Fuel remaining, declare a PAN call when it seemed certain that this would be so, and a MAYDAY when (if) the fuel on board reduced to 20 minutes-worth.

Eight other operators specified that the commander should request a Priority Approach when it appeared likely that the amount remaining on landing would be less than Final Reserve Fuel. Whilst there is some merit in having a 'caution' area before entering a 'warning' zone, it rests with the operator to specify clearly at what point a Priority Approach should be requested and the manner in which the request should be made according to the air traffic environment or region in which the aerodrome is situated. The UK, for example, does not recognise the term 'Fuel Emergency' and notified flight crews by means of an Aeronautical Information Circular (AIC 36/1998 (Pink 170) dated the 24th of March) that air traffic control cannot give priority to an aircraft with a shortage of fuel unless an emergency is declared.

AIC 36/1998 recommends that adequate reserves of fuel should be carried when intending to land in the UK at certain airfields where delays should be expected at times when the associated terminal areas will be busy. This AIC had been re-issued because it again became apparent that too many aeroplanes continued to arrive in the vicinity of their planned destination with little more than Alternate and Final Reserve Fuel remaining. Concern remains that this message has still not been acted upon to the extent envisaged: in late September 2000 one controller dealt with three fuel shortage PAN calls in one shift.

Recommendation 2 Operators should review their fuel policies to ensure that adequate provision is made either through their computer programs or by adjustments made by aircraft commanders or dispatchers (acting in accordance with guidance

or instructions specified in operations manuals) for the Trip Fuel to include, where appropriate, fuel for use in holding prior to commencing the approach when there is reason to believe that this will occur. An example of such circumstances can be found in AIC 36/1998 (Pink 170).

It should be noted, in the context described above, that having arrived overhead his intended (flight plan) destination, there is, according to JAR-OPS 1, no obligation on the commander to set off for his planned destination alternate the very moment that the fuel remaining on board his aircraft reduces to the sum of Alternate Fuel and Final Reserve Fuel. Rather, the commander can decide - as may be permitted by the operator's fuel management policy - either to divert or else to remain overhead his destination aerodrome. This choice exists because it may well be preferable to land at the intended destination with less than the sum of Alternate Fuel and Final Reserve Fuel as opposed to setting course for the destination alternate when upon arrival Final Reserve Fuel could (but not necessarily will) be all that remains. If deciding not to divert, the commander can use Alternate Fuel together with any unused portion of Contingency Fuel to extend the length of time he may be required to hold before commencing his approach at his planned destination.

Miscellaneous Information Displayed on the PLOG

Most computer-generated plogs displayed important parameters such as ERA, cruise profiles, etc, used in fuel plan calculations, and where default programs were employed this information was

generally to be found also or instead in manuals available to flight crews (the operations manual, flight crew orders, aircraft or flight crew operating manual).

Discussion

Adjustments to Computer-Generated Fuel Plan Calculations

Because Contingency Fuel is carried for events that cannot be foreseen, its use should not be planned before departure to compensate for needs that can reasonably be identified as likely to result in an increased fuel burn. Thus, for example, if an operator makes known his intention to the commander of an aircraft whose departure is likely to be delayed that, once airborne, he should adopt a high-speed cruise profile, then the proper course is that the commander should adjust the Trip Fuel sufficient to cover what can now be foreseen as a change to the manner in which the aeroplane will be operated.

In other circumstances where, possibly, fog has resulted in persistent delays to incoming aircraft and it is known that arriving aircraft are being held, prudence would suggest that the commander adjusts the Trip Fuel so that he is assured of having an excess on arrival sufficient to enable the aircraft to hold prior to its commencing an approach.

Company Cultures on Fuel Planning and Usage

Company fuel planning policies varied between operators but nothing was seen that did not accord with the requirements of JAR-OPS 1 and its associated guidance material. Less easy to measure

was the 'company culture', instructions by the operator on the priorities he expected his aircraft commanders to apply such as whether or not to uplift Extra Fuel, to accept enforced delays or to make up for lost time, or to accept additional payload in place of slightly more generous calculations of Alternate or Contingency Fuel. Some operators were reported to have in place 'league tables' that 'ranked' commanders according to the amount of fuel they took on departure exceeding that calculated by the computer program.

The effect of keeping a league table as described exerts a form of pressure on each individual not to be shown up as being different from his colleagues in the fleet and vulnerable to attract attention from his fleet manager. Such perceived pressure is known to have resulted in pilots departing with less than that calculated by the computer-generated fuel plan so that their position in the table could be 'improved'. To depart on a public transport flight with less than the flight plan fuel calculated in accordance with a program accepted by the Regulator as sound - and without good reason - is likely to be in breach of the terms and conditions under which the Air Operator Certificate was granted. In short, such practice places the continuance of the Certificate at risk.

Although none of the operators whose policies were reviewed in the SOC were reported to have specified unreasonable guidelines on the amount of fuel with which commanders might depart, this was difficult to reconcile with some reports that had been received from flight crews. It would seem advisable that some operators should do more to gauge the impact their policies have upon the flight crews they employ and that they

should be prepared to address the issue if it appears likely to prejudice safe operations.

Recommendation 3 Operators should review their fuel policies to ensure that, as interpreted by fleet managers, training and line pilots, these do not result in a perception that aircraft may be permitted to depart with fuel amounts less than must be calculated in accordance with formulae specified in the operations manual (or equivalent document). Where such formulae are known not to address all circumstances that can reasonably be foreseen, pragmatic guidance should be specified to ensure that appropriate adjustments are made. This review might be managed through a schedule applied by the Operations Quality Manager so as to ensure that company policy endures with time.

Conclusion

The results of the Special Objective Check on Fuel Planning showed that all operators who were surveyed applied their fuel planning policies in general accordance with the JAR-OPS 1 requirements and associated guidance material, and that such variations as existed between them reflected the nature of their work and the capabilities of their aircraft. However, there were some issues to which it appeared all operators could address their attention, comprising: inaccuracies inherent in many computer-generated pilot navigation logs; inadequate account taken of foreseeable events; and the manner in which flight crews interpret their company culture on fuel planning.



Whose Job is It?

This is a story about four people named Everybody, Somebody, Anybody and Nobody.

There was an important job to be done and Everybody was asked to do it.

Everybody was sure Somebody would do it.

Anybody could have done it, but Nobody did it.

Somebody got angry about that, because it was Everybody's job.

Everybody thought Anybody could do it but Nobody realised that Everybody wouldn't do it.

It ended up that Everybody blamed Somebody when Nobody did what Anybody could have done.



CABIN OPERATIONS

No Smoking

A 26-year old female passenger on board a transatlantic flight was arrested on landing for illegally head-butting a cabin crewmember.

The crewmember asked her to stop smoking on the non-smoking flight; the passenger refused and then head-butted the crewmember when she persisted.

Passenger Assault

A B777 enroute from Newark to London diverted to Bangor when a 38-year old Moroccan passenger began causing trouble on the flight. He allegedly assaulted not only other passengers, but members of the cabin crew as well.

Assault to Child

A male passenger pleaded guilty to charges of assault onboard a recent transatlantic flight. The flight was in cruise over the Atlantic when the passenger assaulted a seven-year-old girl.

He was sentenced to six months in prison, fined \$5,000 with interest and was required to pay \$400 in restitution to the girl's parents.

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