

# FEEDBACK

Issue No: 50

April 1999

## Editorial

### CHIRP Survey

In the period since the CHIRP Survey Form was distributed with the last issue of FEEDBACK, we have received 3,769 responses. I would like to thank all of those who have contributed to the survey. We are currently analysing each of the responses and the many comments that have been submitted on the Programme and the FEEDBACK newsletter. All survey forms and comments that are received by 31 May 1999 will be incorporated into the analysis. The Trustees will review the data to assess the effectiveness of the present Programme and to determine whether any changes should be implemented. The results of the survey, together with the Trustees' assessment will be detailed in the next issue of FEEDBACK.

We consider it to be most important that we receive as many survey forms/responses as possible to ensure that any changes reflect the needs of the majority as closely as possible. So, if you put the survey form to one side or in your flight bag intending to fill it in at a later date, please take the few minutes necessary to complete the form and return it to our FREEPOST address or, if you prefer, by e-mail.

### Shortage of Engineers

In the period since this Programme was extended to Engineering and Maintenance personnel, one of the main contributory causal factors in HF safety related incidents being reported by engineers has been the pressure that individual engineers feel that they are under, or place on themselves to get the job done in less than ideal circumstances. This issue contains two such reports (Pages 15/16). Inadequate skills and/or training for the task and inappropriate manning levels are often circumstantial factors in the reported incidents.

Earlier this year, the Chairman of the CAA commissioned the Royal Aeronautical Society to chair a senior level working group to investigate the reasons for fewer engineers being available to the air transport industry. The Working Party has completed the study and the findings are due to be published this month in a report titled "The Challenge of the Future in Aircraft Maintenance Engineering".

### CHIRP Website/E-mail Address

Copies of this issue and several back issues of FEEDBACK are available on the CHIRP website at <http://www.chirp.dircon.co.uk>.

A number of suggestions have been received about promoting the submission of reports/comments by e-mail. In response to these we have set-up a new e-mail address for individuals who elect to report in this way. The address is [confidential@chirp.co.uk](mailto:confidential@chirp.co.uk).

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<b>CHANGE OF ADDRESS (IN WRITING ONLY) TO:</b> CHIRP, FREEPOST (G13439), BUILDING F131, ROOM 129, FARNBOROUGH, HAMPSHIRE GU14 6BR FAX: +44 (0) 1252 543860 OR E-MAIL: <a href="mailto:KIRSTY@CHIRP.CO.UK">KIRSTY@CHIRP.CO.UK</a> <b>PLEASE NOTE OUR CHANGE OF ADDRESS</b>
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**A REMINDER ON THE MAGAZINE FORMAT:**

The following fonts are used:

- Disidentified reports. These are reproduced with minimum text changes.
- *CHIRP Comments are italicised.*
- Verbatim Third Party responses are printed in SWISS Type.

**FEEDBACK - COMMENTS**

**Assume or Check? (FB49)**

*The report "Assume or Check?" in FEEDBACK 49 recounted an incident in which the Captain incorrectly assumed that he was clear to pushback and then had second thoughts. The following report details another case in which serious injury was narrowly avoided when the correct procedures were not followed.*

A few years ago a colleague (B747) was placed in a similar situation to your correspondent in Dallas. After pushback and engine start he gave the order to remove the ground equipment but received no reply. He then saw what he thought was the ground-man out on the right side and began to taxi forward. The aircraft hit the tow-bar and knocked the legs from under the ground-man, who had taken off his headset while trying to help the tug driver remove the tow-bar. Fortunately, the crew got away with a nasty fright and some bruised shins but it could have been much more serious.

In the past few weeks during turn-rounds in both Miami and Los Angeles the ground-man disconnected and left the aircraft on his own initiative. In the latter instance before the fourth engine was started! So definitely check.

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**A Lesson Relearned (FB49)**

*This report described a crew's failure to detect a significant loss of airspeed during a night take off from a platform helideck. The following comment offers a procedural solution.*

What often happens is the Non Flying Pilot (NFP) calls "Positive rate of climb" as the helicopter rises from the helideck and calls for the first sign of airspeed (some Air Speed

Indicators don't read below 40kts) and then they think their job is complete.

What they should do is call rate of climb after the Take-off Decision Point (TDP) which is the forward rotation to 10° nose-down), and then call radio altimeter heights and airspeed increases up to 500 feet and 70kts, the normal climb speed. At that stage everything should be stabilised and the NFP can afford to move on to the After Take-off checks etc.

This type of incident is going to become more common as the experience level and to an extent the average ability falls. The helicopter industry is losing its best senior co-pilots and junior captains to fixed wing for reasons that everyone in the helicopter industry will be all too aware.

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**A Common Aeronautical Language**

Your FEEDBACK comment in Oct 98 entitled "A Common Aeronautical Language" prompts me to ask the (probably naive) question: How is it possible for National Governments to override the obvious requirements for the highest possible levels of Air Safety?

I never feel fully "situationally aware" when operating in French airspace and can quote many examples. Recently I briefed a Category 3 (*Low visibility*) Approach at Lyons (Satolan) with an RVR (*Runway Visual Range*) static at 220 metres. My nominated diversion was Grenoble, should we have flown two unsuccessful approaches at Lyons.

Flying downwind on the first approach, a French speaking observer on the jump seat asked me if I knew that ATC were telling French aircraft that Grenoble was not accepting any more diversions because they had run out of parking space. Neither the First Officer nor myself realised this and a very quick fuel recalculation meant that we could only make one approach and then divert to Marseilles!

We all talk a lot about breaking the chain of events leading to an accident. In my opinion the lack of a "Common Aeronautical Language" is going to feature sooner or later, if nothing is done.

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**More on Frequency Frustration**

*Recent issues of FEEDBACK have contained several reports relating to RTF frequency*

*change errors and misinterpretations of RTF instructions. Reports on these subjects have continued to represent a significant proportion of those received in the last three months (see Page 8) and include the following comments:*

**(1)**

A subject on which I have been in correspondence with the officials in my company with responsibility for air traffic service matters is that related to the notification of departure frequencies. This correspondence goes back several years and neither they nor the ATC system do anything to improve matters.

At ##### (major London airport), where I am based it happens late evenings and occasionally early mornings when departing sectors are combined due to reduced workload compared with main traffic flow hours. I believe that the Manual of Air Traffic Services actually instructs that the frequency be given when airborne.

Some controllers are excellent and give you the non-standard departure frequency unbidden - others one must ask when given take-off clearance.

*The Manual of Air Traffic Services (Part 2) for the airport requires that "If a non-standard frequency is in use, the aircraft must be informed before departure, and the frequency must be included in the transfer of communication message." The procedures for two of the three other London airports include a similar statement.*

*The ability to pre-set the initial departure frequency prior to take-off as opposed to dialling the frequency shortly after take off is an obvious benefit to flight crews.*

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**(2)**

At my unit we routinely receive calls from aircraft in the LTMA (London Terminal Manoeuvring Area) who have either misheard or mis-selected their next frequency and found, instead of the next TMA controller, a completely non-related ATS (Air Traffic Services) unit.

Generally once advised of their error and either given what we usually believe to be the correct frequency, or alternatively suggesting they re-contact their last frequency, most apologise or just vanish. However, some foreign pilots require to have this explained more than once which takes time.

My main concern is that this is occurring to aircraft just airborne in probably the busiest airspace (LTMA). There seem to be more than enough reports of separation loss when aircraft are effectively between ATC frequencies anyway and this additional period when an aircraft is effectively out of contact with any (LTMA) controller is a shade unnerving. What is never known is how often they select a frequency where there is no one to advise them of their error and how long they call before re-selecting the correct frequency?

Another point I have is about dual, or more, transmissions being made at the same time, particularly on busy frequencies. It is not uncommon to get two mixed speech conversations where the words heard from two different pilots actually make complete sense and can be taken as a correct readback, a reasonable request etc.

Recent examples; a message from an IFR aircraft indicating that he intended to follow a particular procedure but using Visual Flight Rules. This was accepted and other aircraft procedures/routings were changed to their advantage to reflect this. However a short time later it became evident that the RTF message received had been generated by two different aircraft, one changing frequency when VFR, the other confirming he was still following an IFR procedure.

Another message received indicated the pilot intended to "change his apron". What had been actually transmitted was one aircraft taxiing to the apron and another requesting a running change!

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**More on Altimeter Confusion**

At ### (UK Regional Airport) all the SIDs (Standard Instrument Departures) have a first level-off at FL60. The reasons are obvious in that arrivals are cleared down to FL70 by ### (Area Control) before hand over. This probably makes good ATC sense but leaves a yawning gap in the protection for a level bust.

Aircraft depart with QNH set. This is really in case of an engine failure when Net Flight Path and terrain avoidance are important and because of this all After Take Off procedures are written around Altitudes. A late model Boeing 737 taking off with full power (required under some circumstances) can climb at 6,000 ft per minute (fpm) and although there is a brief lull to 3,000 fpm

during acceleration, this means the aircraft can be at 5,000ft in just over two minutes. At that rate of climb the level-off starts over 1,000ft before the required level.

In those two minutes the following actions have to be carried out:

Call: "Positive Climb"

Call: "Gear Up"

Action: Landing Gear selected UP

Call (at 1000ft): Either "Flight Director, Heading" or "L Nav" depending on model

Action: Switch on both Flight Directors and press L Nav or Heading button

Call (at 1500ft): Either "EPR" (*Engine Pressure Ratio*), "Level Change", "210 knots" or "V Nav"

Action: Press EPR button, Press Level Change button and wind Speed Command to 210 knots

Call: "Flap 1"

Action: Check speed is correct, Select Flap 1

Call: "Heading XXX" (to Achieve a track without nav. aids)

Action: Move Heading Bug

ATC: "ABC123, call Radar 1XX.XX"

Call: Reply to ATC

Action: Change frequency

Call: "Heading XXX" (sometimes a 150° turn)

Call to ATC: ".....XXX departure climbing to FL60"

ATC: "Squawk Ident"

Action: Press IDENT button

Call: "Flap Up"

Action: Check speed, select flap up

Call: "MSA" (*Minimum Sector Altitude*)

Call: "MSA Confirmed X,XXXft"

ATC: "ABC123, call Area Control 1XX.XX"

Call: Reply to ATC

Action: Select Frequency

Action: Wait for break in radio traffic

Call ATC: "Area Control ....."

Call: "Flaps Up, Lights out"

ATC: "ABC123, make your heading XXX"

Call to ATC: Reply

Action: Move Heading bug

Call: "After Take Off Check List"

Action: Carry out After Take Off Check List. This has five items the last of which is "Altimeters"

Those are 44 separate things (including listening to ATC), all of which are done pretty much from memory. That is something every four seconds even if you allow three minutes.

Procedures intended to stop us hitting a mountain mean that altimeters are not normally reset until after MSA, which in the case of a northbound departure from ### can be little more than 1000ft below FL60 (10 seconds at 6000 fpm)

Remember that during all this, one pilot is flying the aircraft round a complicated SID and that any of the ATC calls could come at any point. This is also the minimum that happens. Most of it can wait a bit and as the aircraft approaches 6000ft the autothrottle will start to close and the aircraft level off, but only at FL60 (rather than 6000ft), if someone has remembered to reset the altimeters. However, resetting does not come into any procedure until the After Take-Off Check List. On a busy day with lots of extra things added, I have known the checklist not started until FL100.

I will not mention unserviceable equipment or new staff or congested ATC frequencies.

If the SID has an initial level-off at an altitude, it doesn't matter if we forget something. The aircraft will level off and anyway warning lights and (in some cases chimes) will alert the crew to an incipient bust, but with a flight level as the first level-off all this protection is lost.

*It is perhaps worthy of consideration as to whether the present processes for determining the effects of proposed changes to ATC procedures, such as SID levels and increased sectorisation, give appropriate regard to the consequential effect of such changes on the workload of flight crews.*

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## **Traffic Flow Management (FB49)**

*One of the reports in the last issue - Page 6 Item (1) - detailed problems with the current traffic flow arrangements.*

*The following comments are among those received on this subject:*

**(1)**

I can certainly sympathise with the idea of "charge of the light brigade" in this item.

I work at the main aerodrome in the TMA.

As I understand it flow control is not effectively applied in order to smooth out the peaks of arriving traffic and often not applied at all.

Consequently the airfield is quite often placed under unnecessary pressure to accept arriving aircraft on the departure runway in order to equalise inbound/outbound delays because the "inner stacks" (*arrival holding patterns*) are full.

The airfield is quite often working at capacity and therefore flow control should be applied so that the capacity (defined rates per hour) is more evenly spread. As well as benefiting the aerodrome this would more importantly spread the load on the inbound sectors roughly 40% of which is bound for my airfield. Although I work at an aerodrome I am seriously concerned that continued overloading of certain sectors will not always have a happy ending.

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**(2)**

Good to see the item in FEEDBACK 49 - it raises important issues.

'Traffic Management' (TM) is a vital, complex and growing activity - which is little understood by many of those who are involved with it (both ATC and Airlines!). It's too easy to just 'knock it' when the problem also includes people's limited understanding and their false expectations.

We have always had 'overloads' (their definition is highly subjective!) but now we have someone/something to blame - the Central Flow Management Unit (CFMU) or the local Area Control Centre (ACC) Flow Management Position (FMP). Traffic volumes are being increased and through the benefits of TM prediction techniques safety can be maintained. There are problems with the prediction system and the effects of traffic bunching are the subject of great concern and intense analysis. However the numerical increase in reported 'Overloads' last year doesn't give a true picture as there are many

other factors in play - and I am not diminishing the importance of the reports or the need to take them seriously!

Part of the problem is that controller expectations have been raised and the system sometimes fails to live up to those expectations. The causes include ignorance of system limitations by staff, poor sector/traffic management and, of course, system/computer generated fluctuations (in certain circumstances the system actually induces bunches of traffic). The problem is exacerbated by, amongst other things, aircrew and airfield ATC ignoring departure slots (Slot Busting) and by aircraft being flown to arrive 'on schedule' (speeding-up/slowing-down en-route).

Hopefully a better understanding of TM and greater vigilance (and involvement) by all those concerned will enable us to deliver safely a better service.

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**Getting the Job Done FB49**

*The last issue of FEEDBACK contained a letter from an avionics management engineer, which offered a different perspective on the working of excessive hours and 'ghosters'. The following two comments are representative of many views expressed on this subject:*

**(1)**

This is just in response to the letter headed "Getting the Job Done?" on Page 3 of the January issue of FEEDBACK.

Having read this letter I find that I can agree with most of what is said, but I can see an underlying problem with the comments.

1. If the engineers are requested to do extended hours then this must surely mean that the company does not have adequate staff or planning of staff is not correct.
2. Management rely on or expect staff to extend working hours.
3. Management do not take into consideration, or appear not to, the consequences which the certifying engineer faces for errors through fatigue/long working hours. When the certifying engineer faces an enquiry by the company/CAA, how far behind the engineer will the company stand to support him?

4. When even I have been put under pressure for aircraft to meet departure times, inevitably finance becomes the reason, as these days departments within the company start charging each other for the delays. This in turn puts pressure on safety.
5. On many occasions we have been requested to finish off an aircraft as it was needed, only to find the aircraft still outside the hangar the next day.

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## (2) Work Pressures

This is an engineering observation about engineering reports in FEEDBACK.

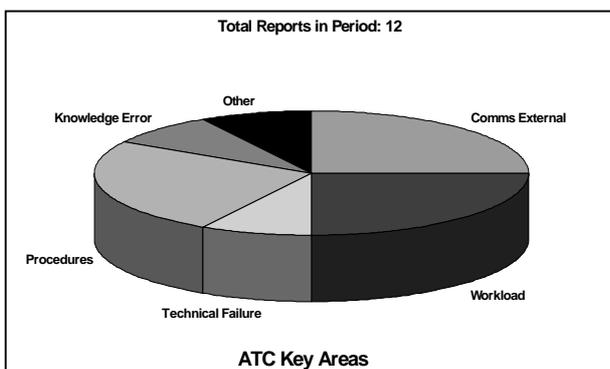
Engineers are paid reasonably well to work under pressure. Most of your reporters are complaining about human factors work pressures. As a licensed engineer FIRST and an employee second, if the pressure becomes intolerable and is in danger of jeopardising safety, then the LAE must call a halt, regardless of the employment consequences.

Most if not all managers of engineers - are also engineers. A culture is required that recognises the value of the LAE by managers and allows the standard to raise. Whilst (ex LAE) managers are trying to give away LAE jobs such as pushbacks, refuelling etc., this does not give a sound platform of confidence within the industry and most of all a good relationship of confidence and partnership with the flight crews.

*Given the industry-wide shortage, it is important that Licensed Engineers are, and continue to be, tasked in a manner that is most appropriate to their skills and expertise.*

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## ATC Reports



**Key Areas:** The chart above indicates the HF related key areas into which all ATC reports that have been received during the past three months have been categorised.

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## How Many Listening?

Recently after issuing a clearance to descend, a pilot declined to read back my clearance because both pilots were not monitoring the ATC radio frequency at the time. I told him that this would not normally be acceptable because of the high workload on this sector (Daventry) and asked if the other pilot was now listening - he was not. After a delay of about 4-5 minutes he read back his clearance, but garbled over the top of the reply from another aircraft and had to read it back again.

I have also had several instances where crews in the same area have missed calls, as both crew were monitoring the Oceanic frequency in accordance with company SOP's. It worries me that we will not be able to turn these aircraft away from emergency traffic, if necessary.

On a separate subject, may I point out to crews that if we issue a climb/descent clearance, for example to be level at FL290, 50 DME MID, that they give us plenty of warning if they cannot make this. Separation with crossing traffic controlled by this and adjacent sectors is based on the assumption that the vertical profile will be achieved. If it can't and we are not advised early, separation can become marginal.

*The safety implications of not maintaining a listening watch on the ATC frequency are obvious. A continuous radio watch on the en-route frequency is required by Article 41 of the Air Navigation Order and re-stated in CAA (SRG) Flight Operations Department Communication No 15/98. However, it should be remembered that two-crew operations are equally susceptible to a 'call of nature'.*

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## Change - An Uncomfortable Process

*When carrying out familiar or repetitive tasks we develop routines that require little conscious thought. In the period following any significant changes in procedures more conscious thought is often required and the opportunity for error may be increased. This can have the effect of reducing an individual's*

*'level of comfort' until the new procedures, in turn, become familiar.*

I've been valid on TMA duties for a number of years. After a lot of debate within the Technical Committee, and through operational necessity (i.e. increasing traffic levels), a new procedure was introduced to allow controllers to climb outbound traffic to the lowest usable flight level above the transition altitude of 6000 feet. This outbound flight level would obviously be dependent on the airfield QNH pressure setting.

I had not done the sector many times since the new procedure was introduced. We'd had a long period of low atmospheric pressure, which meant that the maximum outbound level was FL80 and the maximum inbound level we could release traffic to the Airfield Approach Controller was FL90. On this day the pressure was above 1013mbs for the first time for weeks and it meant that the maximum outbound level we could use was now FL70 instead of FL80. I had been on the sector for about 30 minutes, it had been quite busy with inbound aircraft but the traffic was tailing off. I descended an inbound to AAA VOR to FL90, which was the lowest vacant level above traffic already holding, and then transferred the inbound to Approach. Either before or after this, I got a request to release a departure; to which I agreed. The inbound I'd transferred entered the hold and its label started to garble with other traffic in the hold so that I could only see its callsign and there was no height information on either of the two targets.

The outbound called me and after identifying it and checking the height read-out, I instructed the crew to climb to FL80 instead of the correct maximum of FL70. The outbound reached FL80 pretty quickly and I was waiting for it to clear the holding traffic before transferring it to the next sector for further climb. The outbound suddenly asked me what was the level of the traffic on its left. I told them that it was at FL90 and 1000ft above. At the same moment the STCA (*Short Term Conflict Alert*) started to flash white, then went immediately yellow and then red and it suddenly dawned on me that I had climbed them to the wrong level. It was through the vigilance of the Approach controller and the TCAS (*Traffic Collision Avoidance System*) on the holding aircraft that we avoided an even more serious incident, as both spotted the outbound

aircraft at the same time. Approach gave avoiding action just as the crew of the inbound aircraft was about to take TCAS avoiding action.

During the years I've operated on TMA duties I've developed methods of operating which are second nature to me and this change of procedure has disrupted them and taken away the thinking time I used to rely on. It's also made me start to adopt different techniques and I'm now very conscious of making the same mistake again and constantly checking what level I can use and if I am using the right one. I have a very good safety record and it shook me up and probably still is doing so.

We now have a number of similar procedures for departures from the TMA and we've all seen people forget the change of level and things get very close because of mistakes either by controllers, or pilots failing to change the altimeter from QNH to 1013. Years ago I seem to remember we had position designators on the TMA sectors, which used to be changed when the minimum holding flight level changed but now we have to rely on seeing some small figures transmitted to us by the CCTV from the Airfield Approach stack display. However, these figures are small and are sometimes difficult to read. It has been suggested to the Technical Committee that we got designators for us, which had the levels we could use on, but the idea was thrown out as being unnecessary as they were on the Airfield stack display.

Bring them back now is all I can say!

*The membership of the Technical Committee that considered the proposed change includes operational controllers.*

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### **A Simple Error - Undetected**

*Confusion resulting from the use of the word "Maintain...." in ATC instructions issued by foreign ATS units, as opposed to "Climb/Descend to ...", has been reported several times recently.*

I was recently involved in a level bust, which was my fault, but could have been avoided by good RTF procedures.

Aircraft: "ABC123 descending to FL140, heading 110".

Me: "Roger ABC123. Route direct XYZ, maintain FL110".

Aircraft: ABC123 direct XYZ, maintain FL110".

Mistake No.1 - I intended that the aircraft should maintain its initial cleared level of FL140, hence the phraseology "...maintain FL ---" But I transposed the heading and flight level.

Mistake No.2 - The aircrew read-back mirrored my transmission so I did not spot the error.

I understand that the phraseology "Maintain (new FL)" as a level change clearance is in regular use in other countries, particularly the USA, where this aircraft had come from. Also a descent clearance to FL110 is common practice in this particular piece of airspace, so I am not surprised that the crew accepted my transmission as a clearance to descend.

However UK RTF procedures require the use of the words "Climb" or "Descend" in level change clearances and most controllers, including me, adhere to this. So pilots, when you are flying in UK airspace and you are told to maintain a new flight level without the words "Climb" or "Descend" being used, please query the clearance. At worst you will remind a controller to use correct RTF phraseology and you may prevent an incident.

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### Same Company - Wrong Call

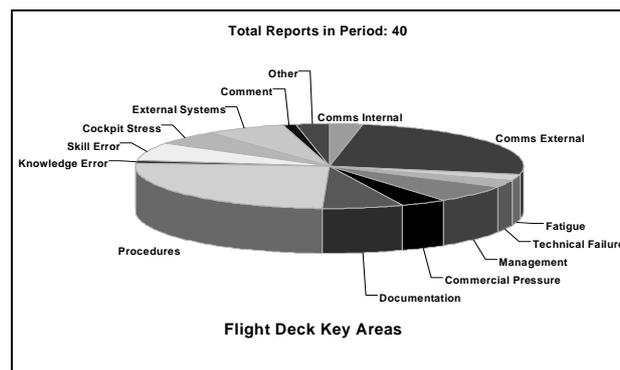
Two aircraft of the same US airline on frequency at the same time resulted in one pilot continuously taking the wrong call despite widely different trip numbers. Also a delay in obtaining a response from calls to some UK pilots, as well as requests for me to say the message again, is becoming more common and can be a real problem when the RT is busy.

A recent familiarisation flight with an American crew highlighted the possible problem. As soon as they are airborne, the headsets come off and the hand mike/flight deck speaker is used. With cockpit noise it was very difficult to make out what ATC was saying or even pick-up our callsign in order to reply. Using the overhead speaker to monitor ATC during quiet periods over the Ocean may be OK but in busy domestic airspace it can cause wasted RT time and potential mistakes through misheard messages.

*For UK operators, the Air Navigation Order (Article 41 Para. 8) prohibits the use of hand-held microphones for RTF communications or intercommunication when the aircraft is flying in controlled airspace below FL150 or taking off/landing. No similar mandatory requirement is imposed on US operators.*

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### Flight Deck Reports



**Key Areas:** The chart above indicates the HF related key areas into which all flight deck reports that have been received during the past three months have been categorised.

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Recent studies of the causes of Controlled Flight into Terrain/Approach and Landing accidents have shown that a significant number occurred during a non-precision approach or when an approach procedure was changed from that anticipated.

Accident investigations have identified inadequate briefings and rushed approaches as contributory causal factors in several of these types of accident.

The following report details how a well-planned, thoroughly briefed approach can also be disrupted and offers food for thought.

### Which Approach Procedure?

Prior to flight we had checked the NOTAMS (Notices containing aeronautical information) and no unserviceability of approach aids was shown. Frankfurt is notorious (with two parallel runways) for not letting you know which one you are landing on until the last five minutes of the approach, so we normally brief both and are prepared for a last minute switch.

About 30 minutes out we obtained the ATIS, which stated weather as CAVOK (*Cloud and Visibility OK*) and Runway 07 in use, ILS 07R out of service. Based on this we briefed and set up for 07L. During the intermediate approach, ATC offered us a shortened route and direct approach if we could keep the speed up, so things were happening pretty fast. I, as Pilot Flying, was fairly occupied in ensuring that we would not get rushed and would arrive at the right place and right speed to commence the final approach. Nevertheless, I am certain that we did not miss any radio calls to other aircraft that might have given an indication of what was to come. The Pilot Not Flying (PNF) did not expect it either, when ATC said "Turn left, heading 060, cleared for the NDB/DME approach 07R" - at a range of about 15 miles.

Fortunately we were good VMC at this stage and could see both runways, and equally fortunately we were at a reasonable speed. I tracked visually using the A/P whilst PNF reset all the aids, FMS etc. and we found the appropriate approach plates. It just about came together by the FAF (*Final Approach Fix*) and we were able to complete the approach without incident.

Afterwards we talked about it and decided that even if we had considered a non-precision approach to 07R we would have expected the VOR/DME approach and briefed for that in any case. FRA were also using 07L for departures and subsequent landings and I question whether simultaneous use of two parallel runways is appropriate or legal if non-precision approaches are in use? Had we been IMC I think a go-around would have been necessary as we were simply not mentally 'geared up' to fly an NDB at that late stage - not confidently, anyway.

The other interesting factor that came out of this was that in the simulator we always get back to final approach speed by the FAF, making the descent rate constant to maintain a three-degree nominal path. However, because of the 'real life' constraints of ATC, we were reconfiguring and slowing up as we descended, making the accurate achievement of check heights much trickier with a constantly reducing rate of descent as our airspeed reduced.

This is the sort of scenario that could provide a trap for the unwary.

*As this reporter notes, the option to go-around should always be retained. A reluctance to acknowledge the situation, abort the approach*

*and start again has been identified as a contributory cause to several accidents.*

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*The previous report comments on the additional challenges presented by a non-stabilised approach. The difficulties that may result from an ATC instruction to maintain a relatively high speed up to the final approach to facilitate traffic sequencing are the subject of another report.*

### **Training -v- the Real World**

As a Training Captain with over 20 years experience I am concerned at the level of commercial input into our operations.

We try very hard to teach the new very inexperienced pilots entering the industry to fly stable approaches. Our efforts are becoming undermined by airports that for commercial reasons tell pilots to fly fixed speeds to typically four miles. These speeds, depending upon the aircraft type, often bear no relation to the manufacturer's recommended speeds for the approach.

Between four miles and touchdown the excess speed has to be shed in order to be at the correct threshold speed. To do this, depending on the prevailing weather conditions, flight idle or speed brake is often required. Also an abnormal sequence of gear and flap deployment is sometimes necessary. To cap it all, when on the runway ATC are badgering for a rapid exit from the runway. This is often before the aircraft is ready to safely leave the landing surface.

I am not a dinosaur and I can handle it, but with the level of experience that we are employing in many sectors of the industry, is this the right way to teach these pilots to fly aircraft?

*It should be remembered that the Aircraft Commander retains the ultimate responsibility for the safety of an aircraft. If the particular circumstances are such that a Commander considers that an ATC instruction may prejudice the safety of an aircraft, he should state clearly and as early as possible that he is unable to comply - not press-on in compliance with the instruction.*

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*The nature of the commercial air transport business requires individuals to work effectively under some form of pressure from time to time. Whereas modest levels of stress*

*may often enhance performance, adverse effects are highly individual and may be caused by many factors.*

### **(1) An Unlikely Source**

Just before reporting for duty following an overseas stopover, I received a fax from the Chief Pilot's secretary: "Urgent you call *Chief Pilot/FOD* as soon as you arrive in UK. You must call before midday (GMT)".

During the return flight (long-haul) I spent a considerable time worrying about the call with decisions/thought processes clouded by what might be a "career-limiting" interview coming-up.

I made the call at 11am to find the *Chief Pilot* had gone on leave, but the secretary said "Only to tell you that your salary has been paid correctly this month".

What she failed to understand was how much an apparently innocent message can adversely affect the safety of the operation.

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*Stress may also be heightened by a perceived lack of understanding/co-operation from other individuals, who in fact may themselves be operating under similar to similar pressures.*

### **(2) An Unhelpful Approach?**

Having held at our UK destination for 15 minutes to await snow clearance we were given initial vectors as the aircraft ahead transferred to the Final Radar Controller. Downwind the First Officer (Pilot Flying) selected flap and we started to decelerate to 180kts from 207kts. I informed Radar of this speed change and was greeted by a snapped "Why is that then!" Somewhat taken aback I replied it was to avoid an extended downwind although I considered it be to a normal reduction. We were then advised that we should ask before reducing speed and were turned onto base and then closing heading.

We were cleared for the ILS but only descended to 3000ft with the GS (*Glide Slope*) below us. When I requested further descent I was informed very brusquely that we had been cleared for the ILS. I explained we were above the GS level at 3000'. Further descent was given and we were passed to the Tower. Sarcastically I thanked ATC for their help and was told "it was my pleasure!" So ended the most unusual exchange I have ever had with an ATC unit. After a long duty day culminating in holding in icing conditions

whilst planning an LVP (*Low Visibility Approach*) approach and a potential diversion, this was not what the First Officer or I really needed.

*The detailed procedures for this airfield require that aircraft maintain 210KIAS during the approach phase, with ATC requesting speed reductions to permit ATC to achieve accurate traffic spacing. The procedure further states that aircraft unable to conform should inform ATC of the speed to be used.*

*In the particular circumstances of this report - delayed approaches caused by the adverse weather - it is likely that both the air traffic controller and the flight crew were subject to additional pressures. Minimum traffic spacing would be an important consideration for ATC to ameliorate the effects of the earlier runway closure, whereas an expeditious approach was the primary concern of the crew.*

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### **(3) Delayed Departure**

I am submitting this report through your columns because I am not proud of my own part in it. But there might be something in it for controllers as well as pilots.

A night departure from the Middle East to the UK. We call for push and start 10 minutes ahead of schedule. We are asked for a boundary estimate. We allow 10 minutes for taxi and add this to the time to the boundary. Meanwhile another aircraft calls for start and is cleared. Presumably his route does not involve a boundary restriction. We are given a boundary restriction consistent with our estimate. After 10 minutes I ask how much longer the delay will be. We are told to wait for an inbound aircraft to pass behind. We are given a new boundary time. We cannot see the other aircraft because we are nose in to a stand, but behind us the taxiways are closed for work so that there is only one route in and out of the apron. Aircraft have to be pushed back a considerable distance to be able to taxi. It takes several minutes. After start we have another problem: we are away from the apron floodlighting and cannot see the pushback engineer who should have showed us the steering lockout pin. He has to return. Eventually we taxi.

Tower now asks us to expedite. The aeroplane is very heavy; we are already taxiing at the maximum recommended speed; and there are fog patches on the taxiway reducing visibility to about 200m. I respond

on the RT that considering how we have been delayed it is a bit rich being asked to expedite. It is now 23 minutes since we called for start. Tower says we will have a further delay for take-off: taxi as we wish. I say that we are taxiing as we are required to. We continue at about 20kts. At the holding point we report ready and are told to wait. After several minutes an aeroplane lands. Nothing is said to us. I ask when we can expect departure. Tower says there is an aircraft at nine miles finals: after that. I ask what separation is needed between arriving and departing aircraft. He says for Cat 3A, 15 miles. I find this hard to believe. I think he is now deliberately delaying us because of my earlier complaint.

We eventually get airborne 38 minutes after we called for start. In that time one other aircraft has departed (having called for start after us) and three have arrived. Not a very impressive movement rate. The boundary restrictions have gone by the board and not been referred to again. I am so angry that all I can do is to fly the aeroplane. 10 minutes after take-off we are given an altitude clearance. The First Officer has to prompt me to make the selection. I have heard the clearance but have not concentrated because of my anger. It is another 10 minutes before it has worn off.

Anger is obviously a flight safety hazard. And a lack of a spirit of co-operation between pilots and controllers is obviously detrimental. I still cannot believe that 15 miles separation was necessary. I believe we were deliberately obstructed because of my complaint.

What would have improved the situation? I think the answer is a bit more understanding and communication. If the controller had told us at the outset to expect 10 or 15 minutes delay because of taxiway restrictions - or if that had been on the ATIS broadcast - the situation would not have developed as it did. The frustration grew with the long unexplained pauses. For my part, I do expect ATC to understand that a heavy jet that is planning a heavy-weight take-off (our rotation speed was 161kt) cannot be taxied like a rally car, because we have to be careful about brake and tyre temperatures. And we need to take extra care in fog. But perhaps I should have explained that rather than be sarcastic. And was the controller's workload high, operating as both Tower and Ground controller? Maybe.

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*Our perception of a situation and our subsequent actions are based on our individual knowledge and experience. In some circumstances our actions/decisions are based on misperceptions that result from incomplete or incorrect information. These may come in many forms. Two examples follow:*

### **Big, Bigger, Biggest?**

Leaving T4 at LHR and taxiing for take off on Runway 27R we had to cross Runway 27L, in use for landing. On contacting Tower, we were about 200m from the 27L stop bar on Runway 23 when the controller said "After the landing company 767 cross 27L".

Out to our right we could see two company aircraft, both Boeing twins, one, smaller, about 50' from the threshold, the other, larger a few miles finals. A B767 then a B777 we assumed. Given our speed and distance from Runway 27L we were happy we could cross neatly behind the landing aircraft and were pleased with such a "slick" clearance, as we were late off chocks and "nipping" across the runway takes a lot less time than stopping and starting a heavy aircraft. As the landing aircraft approached our position, I confessed that I couldn't positively confirm it was a 767 - it might be a 757. The Captain applied the brakes and asked me to check with ATC. Even as my thumb moved on the R/T transmit button the controller told us to "Hold our position". He then cleared the traffic to land and then told us "after next landing aircraft, a Boeing 767, cross 27L".

As we vacated the runway I called "vacated" and thanked the controller for his help. The rest of the flight went smoothly.

No real incident, but the potential for embarrassment and a go-around at least. I personally find it hard to tell a B757/767/777 from a head-on aspect, particularly when distances are involved too, as they have similar shapes (I'm not much of a "spotter"). The ATC controller's vigilance was most commendable. His second clearance to us was in the more usual format for LHR and left no room for misinterpretation.

This incident certainly gave us all something to think about on our long-haul flight!

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## A Low Approach

We were tasked to fly a relatively short offshore passenger sector at night. The weather at the departure airfield was clear but the weather at the ### (*destination rig*) was reported as "not good". There were no trained met observers on ### (destination rig).

The transit flight was normal, we planned a rig radar approach starting our descent into wind at 4nm from 1200ft. The helideck orientation dictated a Left-Hand Seat landing. As Captain (RHS) I flew the approach intending to hand over to the co-pilot for the actual landing.

The approach proceeded as expected. The weather was not good, low cloudbase and fog patches. At our MDH (*Minimum Descent Height*) of 300ft (night) we were in the bottom of broken cloud. At decision point of  $\frac{3}{4}$  nm, 300ft, and offset from our approach track by 15° the co-pilot indicated he had lights visual and to continue.

I descended a further 50ft to 250ft and at approximately 1,000 metres range the co-pilot indicated he was happy to take control of the landing. As soon as control was transferred, I called height and airspeed continually. I could see the lights of the rig in my peripheral vision and at approximately 800 metres, 250ft with 50kts IAS I glanced up at the rig. As I looked back down the AVAD 100ft warning activated and the Rad Alt showed us descending through 100ft. The co-pilot had immediately taken corrective action and we both verbally acknowledged the AVAD warning. I continued calling height and airspeed, we levelled at 50ft and 45kts. There was more power available and I called for it to be applied. We climbed away and at 250ft 60kts we were still 300m from the rig, and the helideck was now clearly visible. We continued the approach and the landing phase was normal and smoothly flown.

Discussing the incident after the flight, the co-pilot felt he had inadvertently descended too low because of the visual cues he was getting from the platform lights. In addition the safety vessel that was in close proximity to the platform was more brightly illuminated (it was a supply vessel equipped with floodlights) and was rising and falling in the swell.

I felt this incident would not have occurred if I had flown the a/c on instruments monitored by the co-pilot, until we were much closer to

the platform with the helideck clearly visible before handing over to the landing pilot as an S.O.P.

I wonder how many others have found themselves in a similar situation on a night approach to a rig in bad weather.

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## SID Changes

Recent changes to the SIDs (*Standard Instrument Departures*) at Paris CDG (1 March 99) seemed to be causing confusion with London ATC more than a week after the change. This, in addition to the normal problems of operating in French airspace, was a potential flight safety hazard.

Ten minutes before departure, we obtained our clearance - Nurmo 8K departure, Runway 08. Obtained taxi clearance - taxi to R/W 08 (not informed whether left or right). Eventually told to hold at Runway 08L, departure Nurmo 8L. Airborne, routing changed to VESAN - RATUK. Never having heard of these reporting points, and not understanding the French pronunciation, it was sometime before we located them - after being spelt. Needless to say they did not appear on our flight plan! Then, on calling London, we were given the 'old', pre - 1 March routing.

Another potentially unsafe practice being followed at CDG. On first contact with TWR, each aircraft is given clearance to land, even though two or more may be ahead, and, in our case, two aircraft cleared to T/O!

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*Some older fleets have significant variations in equipment standards that provide additional human error traps for the unwary.*

## Interrupted Checks

During engine starting, the No 1 engine flamed out approximately 30 seconds after starting. Upon investigation, the No. 1 Fuel low-pressure valve switch was found to be in closed selection. I had failed to re-open the switch during my pre-flight checks. After opening the valve the engine was restarted and all engine parameters were subsequently normal.

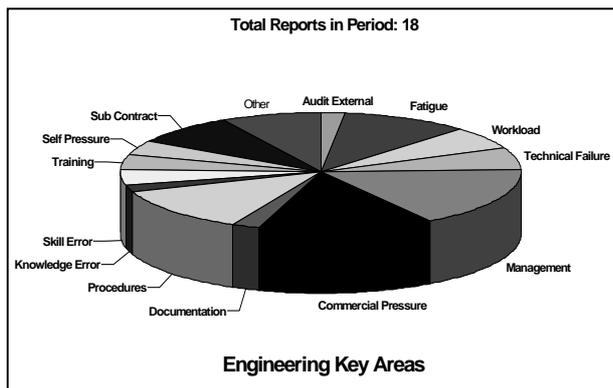
Not an excuse, but the reason that I made the mistake was that I had been interrupted during my earlier checks of the fuel panel and when later resuming the check had failed to

notice that the switch was closed. Also, the design of the switch indicators and the switch guards vary between aircraft and some guards, as in this aircraft, cover the switch preventing a visual check.

In 20 plus years I have never done this before and hope and pray that I won't do it again.

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## Engineering Reports



**Key Areas:** The chart above indicates the HF related key areas into which all engineering reports that have been received during the past three months have been categorised.

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One of the recurring HF related causal factors in accidents/incidents is that related to 'taking a chance' or 'bending the rule(s)'. This attitude can affect both individuals and organisations alike and may lead to dubious administrative, engineering and operational procedures being regarded as an acceptable everyday practice. The following three reports provide different examples of this problem:

### **(1) Equipment Approval**

Equipment is required to be Approved for fitment to aircraft and thus must conform to an Approved design. This report shows how one operator approached the problem of fitting an item of flight deck equipment.

Rectangular aluminium boxes with welded seams, to a non-aircraft specification and of unknown construction and background (i.e. no material or manufacturing certificates or certification supplied), have been supplied and installed on the flight decks of two aircraft, port side of the flight deck, directly behind the P1 (Captain's) position.

Several complaints have been made in-house by both flight and engineering personnel that the items had been subject only to minor modification action. All apparently to no avail in as much as the containers remain on board the aircraft!

I am led to believe that the operator considers this stowage to be a 'variable load' and subject to being taken on/off the aircraft. However:

- a) There is no procedure or responsibility for carrying the item on/off the aircraft.
- b) The container, when full of documents, is very heavy and impractical to be manoeuvred by one person.

Following a crew report, a directive was issued to install a catch to secure the containers, again with no modification. This action has been carried out and as yet has not been certified in either aircraft technical log. It has also been the subject of two acceptable deferred defects.

It is my personal contention that this stowage could be a danger to the flight crew and consequently the passengers and aircraft. It has not been subjected to modification action. Hence, materials, workmanship, design, stress, weight and balance, and safety have not been given the appropriate consideration as required by the UK CAA.

After reviewing the nature and purpose of the stowage, we represented the reporter's view that this stowage should be subject to major modification action to the operator. The operator advised us that the situation regarding the stowage had been re-appraised. Steps have been taken to reduce the number and size of the documents stowed and hence the weight. When this has been finally accomplished the design of the stowage will be reviewed in conjunction with the Approved Design organisation to achieve "a more permanent solution".

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### **(2) Staff Approval**

Staff are also required to be Approved to sign for work performed on aircraft. In this report staff were faced with coping with a particular situation for which they were not experienced or Approved.

This incident involved a base maintenance task and occurred during a night shift duty when a hand-over was given to an A&C

Licensed Aircraft Engineer (LAE) and Shift Supervisor detailing the final stages of installation and function checks of a landing gear assembly. Neither the LAE nor the Shift Supervisor held approvals on type. Neither had received any formal training on this particular aircraft.

With three aircraft on maintenance during this night and only two licensed staff to cover i.e. the LAE and Shift Supervisor, the LAE was detailed to continue with the landing gear replacement.

During the very brief verbal handover given on the gear replacement, the LAE and Shift Supervisor were informed that there was approximately two hours work to finalise the aircraft and prepare for departure. This was subsequently to prove not to be the case. The unfamiliarity, lack of type training and gross underestimate of the time-scale for the amount of work required to be carried out led to the aircraft being delayed from going back into service. A subsequent management enquiry into the delay put additional pressure on the night shift staff for not completing the work in the available time.

*When initially contacted, the relevant Quality department denied that this incident could have happened and subsequently stated that they would not expect an untrained and unauthorised engineer to carry out tasks that should be carried out by trained and authorised staff.*

*We were confident that the facts were as reported and consequently passed sufficient details to the company of this and several similar incidents to permit them to be investigated without implicating the reporters.*

*In the period since this incident was reported to us, there has been a major management reorganisation within this engineering organisation and a number of initiatives put in hand. As a result the key issues raised in this report have been addressed through a number of personnel, recruitment and training initiatives.*

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### **(3) A Minimum Fuel Policy?**

*This report is one of the more serious dubious operational practices to have been brought recently to our attention.*

On arrival (at a UK airport) a foreign registered long haul four-engine aircraft was originally given a particular parking stand.

However, on taxi in the aircraft went to a stand closer to the taxiway cutting its taxi time down. [At the time of morning there was no reason for a stand change on this day at such short notice, as the stands are not fully utilised).

On entering the flight deck the EICAS (*Electronic Systems Display*) indications showed an arrival fuel contents figure of only 3400kgs. Two of the four main fuel tanks were indicating empty and showing amber quantity warning lights. The remaining fuel was located in the other two main tanks. A verbal report from the crew claimed that the fuel on landing had been 4,000kgs. The fuel levels were too low for hydraulics maintenance checks to be carried out.

If a go-around had been called for, the crew would not have been able to put the aircraft into the correct configuration of tank-to-engine feed due to two of the tanks being empty. Also if a go-around had been required, would sufficient fuel have been available for a diversion to another airport?

I understand that a typical minimum requirement on landing, world-wide, is at least 5,000kgs for this type of aircraft.

This was not a one-off incident. Previous reports on similar situations with this airline have been made to my company Quality Department. I do not know if anything can be done except for pressure to be put on the foreign Regulatory Authority to require minimum arrival fuel figures for airlines under their authority to fly over populated areas with enough reserve fuel for safe operation.

*Further investigation of this report revealed at least 10 other recent instances in which low arrival fuel states had been recorded by the handling agency. The handling agency had reported these occurrences to the operator without any change in the operation being apparent.*

*Details of the occurrences, suitably disidentified to protect the reporter's identity, were provided to CAA (SRG) and the Department of the Environment, Transport and the Regions. Appropriate action is being taken.*

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### **Medically Fit?**

*Nightshift duties can and do give rise to fatigue-related errors. An individual may*

*become more susceptible to this type of problem when he/she is not feeling fully fit and/or taking medication.*

The company has a policy of having one Approved Engineer on nights to "see" through transiting cargo aircraft. This involves debriefing the crews and ensuring the transit goes smoothly. He also has to see in the arriving aircraft and 'ride the brakes' while the handling agent moves the aircraft from the arrival stand to a parking stand. If possible he also tries to do a hot oil check and a quick visual (*check*) for obvious defects to prepare the way for the oncoming day shift.

On the night in question I was not feeling particularly well but not sufficiently bad to warrant going sick. I had been suffering from a mild cough for which I had been taking Actifed Cough Linctus. However, the cough had been keeping me awake during the day, so I was feeling just a bit below par.

The aircraft arrived on schedule and while waiting for the load to be off-loaded and the tug hitched-up I carried out a hot oil check and visual inspection. Nothing untoward found. I then rode the brakes while the aircraft was moved, closed up the aircraft and returned to the office. I then realised I had left the Tech Log on board the aircraft which meant a drive back to the aircraft to retrieve it of approximately five miles. This I did, opened the crew door which involved switching on the external ground bus selector switch to open the door climbing into the aircraft climbing out again and reversing the process to close the doors.

The following evening on coming on duty I found I had left the Ground Bus switch on which had flattened the batteries necessitating their replacement. On recollection I could not remember climbing back out of the aircraft or closing the crew door. I realised then that the combination of tiredness and the medication had put me in to a very precarious situation. It was fortunate that I did not have anything more complicated to do that night otherwise it could have had serious consequences.

*It is important to be aware of the possible effects of any medication and not to take unnecessary risks. Airworthiness Notice No.47 contains advice on these matters:*

**Para 3.7 Medication.** Any form of medication whether prescribed by a doctor or purchased over the counter and particularly if being taken for the first time, may have serious consequences in the aviation maintenance

environment unless three basic questions can be answered satisfactorily:

- a) Must I take the medicines at all?
- b) Have I given the particular medication a personal trial for at least 24 hours before going on duty, to ensure that it will not have adverse effects on my ability to work and make sound decisions?
- c) Do I really feel fit for work?

Confirming the absence of adverse effects may need expert advice and General Practitioner, Company Medical Officer and the Medical Division of the Civil Aviation Authority are all available to assist in this matter. Common types of medication in use and their effects are further described in Appendix 1 to AWN No 47.

*Appendix 1 to AWN No47 contains information on sleeping tablets, tranquillisers, antibiotics, antihistamines, pep pills and other common groups of drugs.*

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## **More for Less**

*The industry continues to experience the effects of a shortage of appropriately qualified engineers. Although a medium/long term solution to this problem is widely recognised as being essential to the future success of the industry, the workload that is sometimes placed on those currently available continues to be the subject of reports.*

This report comes as a result of my concerns about the situation I have found myself in and to highlight what I believe is a disturbing trend toward excessive hours on duty, excessive responsibilities being heaped on key individuals and inadequate training.

I have been involved exclusively with this operation for six months of this year.

The aircraft schedule has me at the airport at some time each day seven days a week. Now that the carrier has based a later type at the airport, I have been additionally burdened as the only signatory for the aeroplane on the airport and purely on the strength of a familiarisation course I had previously attended.

I repeatedly warned the Powers That Be (within my own organisation) of the forthcoming predicament with the new aeroplane but to no avail. I continue to scream for support and training and for my efforts more engineers have been trained.

The aeroplane is radically different from the previous series, on which I have had full

training. The engine is completely different. One or two avionics engineers have had full courses but do not hold appropriate licenses, so I am expected to sign for them on the strength of a familiarisation course and the prospect of a further familiarisation course.

Now the carrier has begun putting another aeroplane through the airport. I also hear talk of the introduction of yet another flight.

I continue to wait for the carrier and my company to address my complaints but turn to the Authorities because I lack faith in my employer's sincerity and understand that commercial pressures encourage them to put off a hard decision. I am not happy taking this course of action but cannot continue with the status quo.

*CHIRP made approaches to the support agency and the Regulatory Authority on behalf of this reporter. By a combination of persistence, favourable commercial circumstances and the assistance of the Regulatory Authority, the inadequacy of the support arrangements were acknowledged and have been addressed, both in terms of numbers and training of engineers.*

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### Management Hours

*A reasonably widely held view is that long hours at the place of work signify personal diligence, organisational efficiency and high productivity. Two important questions that are rarely tested are what was achieved in the extended period of time, and how good was the quality of work/decisions? When these are evaluated, the apparent benefits are often more than balanced by the reduction in overall efficiency and the increased risk of error.*

During a recent performance appraisal my immediate supervisor informed me that he was frequently in the office at seven in the evening following an eight o'clock start. I was advised that this should be considered normal by Management staff. As we are a Technical Services unit there can be few problems so serious, or urgent, that such hours, worked regularly, can be justified.

I have no objection to working long hours to get an aircraft away and have frequently done so in the past. I consider the attitude of my supervisor to be less than responsible in that it suggests, or appears to suggest, that management are exempt from the provisions of Airworthiness Notice No. 47. The fact is

that other engineers asking advice of Technical Services Engineers expect to receive a considered response from a suitably rested individual. If the Engineer is not fit, as defined by Notice No. 47, and a 60-hour week might suggest otherwise, there is a risk to the whole fleet from his or her fatigue induced errors.

After more than 15 years in the industry I know that my practical limitation is significantly less than 60 hours in any five day working week. If I have to work five days then one day of 10 hours is sufficient that I am below par the following day. This is more apparent the later the finishing time. Airworthiness depends on EVERY engineer being fit for work all the time that he/she is on duty and Notice No. 47 applies to EVERY engineer, Licensed or not. This report is not strictly an "Incident" but highlights the potential for incidents represented by some managers.

*AWN 47 does indeed apply to all engineers and no less to management engineers. Murphy's Law will usually ensure that the really urgent and complex situation requiring a high quality decision will be encountered at the end of a day, or out of hours.*

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### CAA (SRG) Flight Operations Department Communications

*The latest CAA (SRG) Flight Operations Department Communications have been issued since January 1999:*

#### 1/99

1. Letter of Consultation: Proposal to Amend The Rules of the Air Regulations 1996.

#### 2/99

1. Letter of Intent: Proposal to Amend the Air Navigation (No 2) Order 1995 (The ANO) to Include Military Flying Hours Within the Definition of Flight Time.

#### 3/99

1. Operations Manual Requirements for the British Formula 1 Grand Prix Event, Silverstone 11 July 1999.

#### 4/99

1. Letter of Consultation: Proposal to Amend the Air Navigation (No 2) Order 1995, The Rules of the Air Regulations 1996 and The Air Navigation (General) Regulations 1993.

#### 5/99

1. North Atlantic Minimum Navigation Performance (MNPS) Airspace Operations - The Importance of Accurate Time Setting and Timekeeping.