



Confidential Human Factors Incident Reporting Programme

FEEDBACK

AUGUST 1990

NUMBER 22

AUTOMATION QUESTIONNAIRE

One of the reports about a "glass cockpit" aircraft in the last FEEDBACK caused a bit of a stir! That made us, and others, realise that there is not a lot of information available about how pilots get along with all the gadgets. An interesting survey was carried out in the US a couple of years ago, but the CAA has asked us to seek the current opinions of pilots in the UK on cockpit automation. The real point of the present survey is to try to identify areas that might benefit from more research, study, or just thought. This is your chance to say what you think and know that your voice will be heard.

You will have noticed by now that there is a copy of this questionnaire enclosed with this edition of FEEDBACK. We've made it as easy as possible to complete and to return the questionnaire, so please have a go at it.

FEEDBACK AND THE MEDIA

Within a day of each copy of FEEDBACK being circulated, some of the more "sensational" bits always appear in the media. Frequently these give the impression that the situations described were much more dangerous than in fact they were. We're afraid that there's nothing we can do about this since FEEDBACK is distributed to all 15,000 or so of you air traffic controllers, pilots, flight engineers, and other interested parties.

Everybody knows that aviation can never be totally safe, but CHIRP's here to try to make it a bit safer. The clear objectives of the system are to enable professional and concerned individuals to report their errors without suffering any consequences, to alert the authorities to the problems revealed, and perhaps most important of all to feed back to you, in FEEDBACK, the lessons that others have had to learn at the expense of some stomach acid.

If a bit of "Phew what a scorcher.." publicity is the price that we have to pay for this, then it's a price we might as well pay cheerfully.

Remember:

- ✉ our comment;
- your report

We have a great deal of trouble keeping up to date with your changes of address. Current rates of promotion are obviously too rapid. We also know that some of you have never been on the mailing list at all: all commercial pilots, air traffic controllers and flight engineers should be. So...If you move house, let us know... or are not getting it at all, let us know... or newly licensed, let us know.

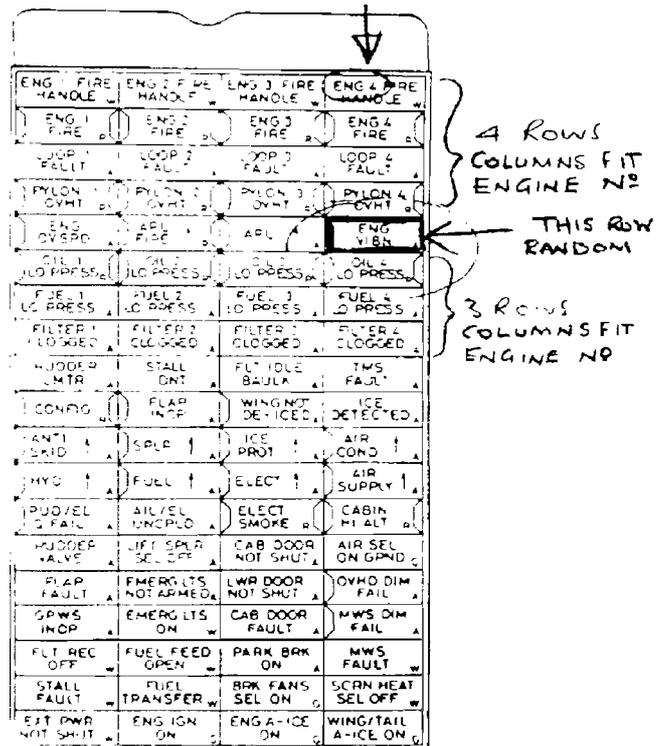
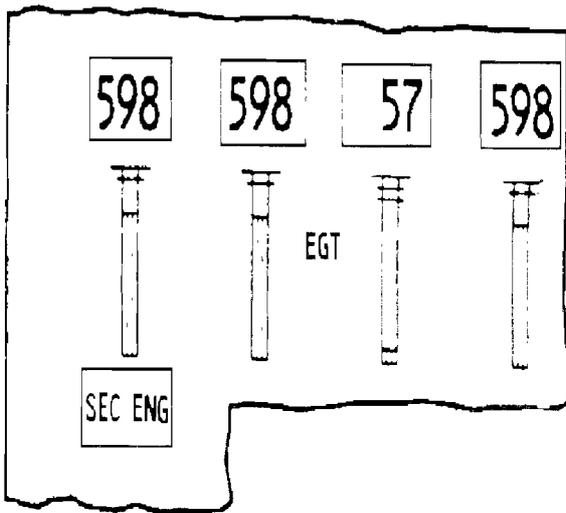
“SHUTTING DOWN THE RIGHT ONE!”

Having an engine fail and shutting down the wrong one is a topic of some current interest. It's obviously important that cockpit instrumentation and displays are designed to make it as easy as possible for a pilot to get it right. Here we have, however, a couple of illustrations that you have sent us where problems seem to have arisen.

The picture on the left shows part of a “page” from a screen in a glass cockpit. The “SEC ENG” caption here could actually relate to any engine (you have to call up another page to find out which), but it's easy to see how a pilot could get the message from this display that the problem is with No.1.

The picture on the right shows a similar problem. Rows 1-4 and 6-8 in this panel are all arranged in four columns associated with engines 1-4. Row 5, however, isn't like that! Easy to think when the ENG VIBN lights up (which could be from any engine) that it is a fault on No.4?

Please let us know of any similar examples which come your way.



WHEN DOES TIRED BECOME FATIGUED?

● We were on the third approach, having missed twice before and carried out Standard Missed Approach Procedure.

We were on ILS with First Officer flying and at 200ft AGL (DH min alt) I called “Min Alt. No contact go around missed approach”.

From here it had been briefed for an automatic No Call Procedure i.e. Pilot Not Flying (PNF) would immediately select overshoot flap. Pilot Flying (PF) would apply max power and pitch aircraft to 13 degrees ANU. PNF would on observing a positive rate of climb select gear up, and then trim the power within operational limits.

In this case at 200DH I (PNF) reached around the power

levers and selected flap 20 but missed the notch and wasted 1 to 1.5 seconds getting the correct selection.

I then (again reaching) took the gear handle in hand and checked the VSI, we were still descending! A quick glance at PF altimeter confirmed we were now at 100 AGL (still IMC). My call was “Pitch Up NOW” and firewalled the power levers and we flew away from the ground and carried out a Standard MA.

The point in issue was this was our 3rd of 4 sectors but our 6th IFR approach to MA. This is no big deal but there had been compounded delays at each stop and so fatigue was setting in and to miss again meant at least a 3hr delay at the diversion airport adding to the fatigue. I think that the F/O (PF) was trying to “cheat” and get in at all costs - he was suitably counseled after the MA and on the ground at the diversion airport.

On the diversion departure the Co-PNF this sector, called V1 at 100kts (100 is an ASI check only, V1 was 135).

From here on the mistakes were numerous, some just annoyances, some were just silly but all were due to fatigue. We ended a 12.5hrs duty, zombies, and were required to fly again 12.5hrs later (the legal min rest). I refused and there was considerable annoyance from Ops because of my "belligerent" attitude. But I stood my ground, and was stood down for 24hrs.

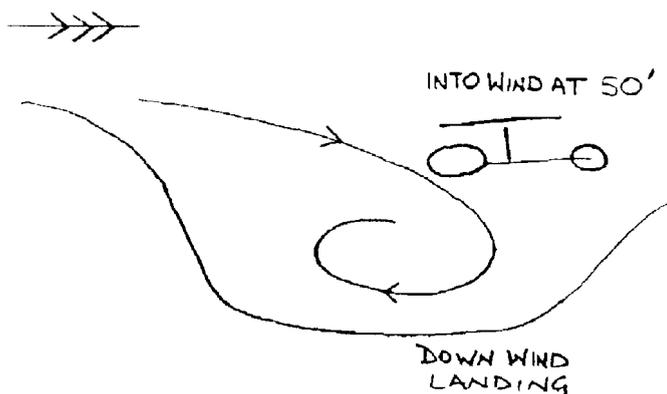
☞ This is just one of many reports which are still complaining of CAP371 being interpreted or modified to obtain the extreme limit of duty time and the effect of being stretched to that limit.

DESCENT: DISTRACTION: DOWNWIND: DISASTER?

● Patrolling power lines after the recent storms. A very windy day with heavy showers, we flew through a particularly heavy shower (anti-ice on, pitot heat on, reduced speed etc. no problem) suddenly "whoosh-whoosh whistle" the blade tape had come off one main blade causing an increase in vibration and a pretty whistling noise. Still no big problem. Look for somewhere flat and level to land in order to strip off the offending tape. There in the valley bottom was a small paddock. I started a descent, turned into last known wind direction (230/40) when at about 50ft AGL and 20kts IAS the aircraft started to sink rapidly. Full power and some (110% TQ) just stopped the sink and we arrived a bit breathlessly. What went wrong? Silly me forgetting that wind directions change so quickly in hilly country - I was 180 degrees out of wind on landing although into wind at 50ft AGL. If I had been heavier or slower reacting then we would have bent it.

You still learn after years and years. Don't let one problem make you operate hurriedly and cause a bigger problem.

ATTACHED: Small sketch showing wind/landing pattern.



☞ Prompt recognition and action can 'save the day' if the error is noticed as soon as the results begin to show. Don't think it can't happen to you because there are 'design failures' present in any human being. In some ways, the more highly skilled you are the more you are open to error.

I'M NOT LOST...

● I'm called out at the end of my standby to get to an outstation as quickly as possible to position the a/c to beat the night jet ban. Major transport problems delay me and we depart in a hurry into a crowded TMA. It is immediately apparent to me that the FMC map is totally wrong and we hastily start manually tuning VORs to comply with our transit through the TMA. I have the number 1 needle on VOR and the number 2 on the locator NDB, both are coding but the ADF looks wrong. The F/O collects the ATIS and has to repeat runway in use in order to cut through my geographical fog. Radar gives me a left turn for base instead of the right turn that the number 2 needle has been leading me to believe. I shake off the disorientation and complete the approach. What should have been a straight forward, pleasant positioning sector had been a disorientating, hard working rush reverting to non-standard, unusual for type navigation, that took my complete attention to safely carry out.

Had I given myself more time I would have found previous reports in the Tech. log of the number 2 ADF bearing problems. I'd hastily scanned the NOTAMS but didn't READ them and finally I'd entered the wrong airfield into the FMC when referencing the IRS. The manual states this is impossible as a re-alignment is refused if a significantly different position is entered as had existed on shut down. The new position, if displaced, has to be entered three times. This did not happen.

So it's the old story, it's always a combination of problems that does us but give yourself the time you need and concentrate on the normal methodical pre flight departure routines. You may care to consider the implications had it been an EROPS sector.

☞ We've had a number of reports describing events like this with inertial systems. One described how a problem at the start of an EROPS trip caused an unscheduled landing to re-align the navigation equipment, and reports in other incident databases refer to pilot input mistakes being accepted by the aircraft equipment without any error feedback.

It may help to bear in mind that when the inertial system is starting up it is first able to measure accurately the vertical; it can then measure motion in any of the three dimensions related to the vertical, and that includes the motion of the earth spinning. If, by chance, you are at the North Pole when these measurements start then all the motion measured will be in the horizontal plane. If exactly on the equator then all the motion sensed will be in the vertical plane. At places in between these two extremes the mix of motion will provide a rough assessment of latitude which is compared with that inserted as present position; with usual error checks the size of error capable of being measured at about 50 degrees latitude is 60 nautical miles. It is not possible to sense longitude so any

figure can be entered without error indication as it cannot be compared.

Some aircraft have an automatic position update based on the radio aids but these are sometimes inhibited in certain areas for technical reasons. If the error is spotted and the correct position inserted the electronic maps may still not be aligned until the aircraft begins to navigate on the takeoff run. There may also be a way of updating in the air which will cure the problem but CHIRP awaits the technical information. There have been occasions when the only solution has been for the embarrassed crew to make an unscheduled landing and align the inertial system from a standing start. The equipment was not capable of providing them with a warning of the particular error in the present position inserted. The error which can be accepted when close to the equator is even greater.

IN INTERNATIONAL AIRSPACE INTERNATIONAL RULES APPLY

● We were cleared "IFR out of France to UK climb to FL120 request level change squawk xxxx". ATC advised us of VFR traffic at FL65 routing on our track. The first officer was flying the aircraft and I was completing the after take-off checks. We had accelerated to normal climb speed of 280kts and as we passed through FL65 the F/O took avoiding action on a Cessna "puddlejumper" which literally flashed before our eyes. The subsequent air miss investigation revealed that the Cessna was quite entitled to be flying VFR in controlled airspace and that we were at fault for not having seen him earlier. The point I am trying to make is that with a closing speed of nearly 200mph we were very lucky to have seen him at all.

To bring this incident into a simple context it is like driving down a motorway at 180mph with a car ahead stopped in the same lane. Not an experience I have encountered or would ever wish to! The French regulatory authorities seem unconcerned that below 15000(?) feet they have a potentially lethal system which in effect means there is no such thing as IFR in VMC conditions below that height. Fellow aviators be warned.

☞ Be warned indeed, but to put it further into context - if you look at the documentation on ATC nearly every country in Europe has "Standard except for..." somewhere. The French and Germans have the most to say on the subject, closely followed by the Italians. Just because the controller is using the same language it doesn't mean he's using the same rules!

FINGER TROUBLE

● Nowadays a young lady on the flight deck is not supposed to raise eyebrows, let alone hackles but, the other day, I was confronted with an unexpected problem on initial approach.

Our SOPs require us to alert the other crew member when we have 1,000ft to go to the cleared altitude. This is normally done by calling "One to go" or, if the radio is in use or the crew member is otherwise engaged, then a finger is presented in front of their nose. This finger is wagged as an "attention getter" in what a prude might say was a suggestive manner.

We were on the approach, cleared for a standard ILS, passing FL55 for 45, with the speed reducing through 250kts (flap limiting speed 240kts) and I was on the point of calling "One to go" when the wireless sprang into life. So rather than call out, I had to present my finger instead. I came over all coy and found that I just could not bring myself to waggle it in the manner usual amongst pilots and so I presented it quite rigid. She selected 1 Flap!

Need I say more?

☞ Very definitely a problem in the area of human factors. You can tell that the reporter is an 'old fashioned Chap' by the use of the word "wireless". With one's feet up on the desk considering the problem over a cup of coffee it is easy to suggest that the finger pointed at the altimeter might have been more successful, but suggestions will be accepted on a postcard please, and the best published in the next FEEDBACK.

DON'T CONFUSE ME WITH FACTS, MY MIND IS MADE UP!

● Descending into Luton, under London ATCC. Given LOREL arrival for Luton, landing 08. Fine. Then very helpful controller gives radar headings to get us down to 6000ft. Excellent. Then "cleared to Henton". Oh dear, Henton appears on departure chart from Luton - we have arrival plates out. Embarrassed crew have to ask busy controller for Henton frequency - otherwise it would have been 2-3mins/12-15mins before the necessary charts were to hand. I dread to think what a foreign aircrew would do! I'm not knocking ATC - but please, if they change procedures, would they please send us to somewhere on the "arrival" procedure!

☞ CHIRP is told that the predicted increase in traffic will eventually prevent such expedited LOREL arrivals anyway. Until then the controllers concerned are aware of the problem, and will try to use only suitable reporting points.

TO ERR IS HUMAN...

● Fresh back from my days off, gave relief on the Tower. First time on the Easterly Runway after a fairly protracted spell on Westerlies, Zone IMC 5-6 km.

Had been operating happily for about half an hour when Approach co-ordinated an inbound light aircraft, SVFR, which I instructed them to hold at the Zone Boundary due traffic ahead. First call from the aircraft was "Crossing the Zone Boundary", which came as a surprise, but as the traffic ahead was just landing, I didn't query the fact, but read him the standard Zone Entry clearance, which he read back.

When he called on base leg, I instructed him to report final and when he did, I cleared him to land. I repeated the landing clearance when he failed to acknowledge the first one. After about a minute, when I couldn't see the aircraft either on final or on the DFTI, I requested his position; as I did so, he came into my line of sight rolling to a stop on the Westerly Runway!

In response to my query, the pilot stated that although he had been given the Easterly runway by approach, I had changed it when he called the tower. I was stunned, but the pilot sounded quite sure, so I said I would check. I was still rather surprised that he hadn't queried the runway change, especially when I gave him what must clearly have been a tail wind with his landing clearance. Fortunately there was no other traffic around, so no one was endangered, and approach didn't notice, so the event went unremarked.

I was subsequently able to confirm from an independent source, that the fault was indeed mine, and that although I issued a zone entry clearance with the correct routing for the Easterly runway, I'd inadvertently passed the wrong runway QDM. The pilot took me at my word, it seems, and followed the non-standard route to the Westerly runway.

I would have sworn on the Bible, that the pilot never read back the runway, but it seems he did, and I, presumably hearing what I expected to hear, missed it! Regrettably, I didn't apparently specify the runway in either the instruction to report final, nor the landing clearance, and the absence of other traffic meant that the runway wasn't mentioned to anyone else, so the pilot wasn't alerted to my slip.

In submitting this, I had to consider that had the pilot been at fault, I would have been obliged to report the fact, so it is only fair that I report myself. The potentially disastrous consequences of my error in different circumstances, have not however been lost on me, and in future I will make damn sure that I listen carefully not only to what I'm saying, but to what the pilot is saying to me too!

☞ A brave and honest chap who shows that it is just too easy to make a slip. Had there been more traffic, the hazard would clearly have been greater, but there would also have been more

chance of this pilot noticing the error. We just don't know whether this pilot noticed the strange routing or tailwind landing clearance; he may well have had a mental question mark but pressed on anyway. Unfortunately, pressing on when uncertain has not been a spectacular success in the past.

MORE HASTE - LESS.....

● Over the past year or so I have noticed a tendency for the large carriers in the UK to call when airborne, that they are squawking ident. Until now I have just found this a nuisance because invariably you still have to ask their passing level (to check the "C" readout), so little if any R/T time is saved. However tonight a departure called with ABBA ident, I was busy but I did see the ident but did not particularly check what the pilot had said against my strips. My strip said ABBB and this is what was passed to the handover controller. However due to an error by my assistant he had passed ABBA to the departure airfield and also to our code call sign conversion operator. As far as I was concerned the a/c I expected was showing - however the handover controller assumed that the a/c hurtling towards him showing ABBA was some other a/c on which I had failed to inform him. Please let's stick to identifying when asked otherwise, although it may be a habitual train of thought of what the controller first says, anything to disjoint this at a busy time may cause a serious misident error or in those confusing moments of sorting out the problem something even worse.

ATCO R/T may not be all it could be but a smart pilot is a dangerous thing!

☞ So, all you "smart" pilots out there have something else to remember when making first contact.

THE CLASSIC ERROR

● Third early start. 0500 wake up call.

Third sector of the day. The slot we were given meant a 1 hour+ delay. We negotiated a new slot on a new route. Altered fuel figure. Engineers fixed a snag. Pushed back - taxied out. ATC cleared us to the wrong runway. My headset was intermittent. Found out the engineer had not fixed the snag properly. Went back to another stand. Renegotiated slot again. Engineer fixed snag. Pushed back - taxied out. Did checks - received final loadsheet figures.

Finally we were cleared for take-off.

On take-off one thrust gauge reduced then recovered.

Normal rotation.

Captain called "gear up".

I said "gear up" and selected flaps to zero.

We applied full power and selected gear up.

The aircraft accelerated well and there was no stick

shake.

Why did I put my hand on the flap lever? I don't know, I don't remember doing it consciously.

I had been working hard and was a little tired but I was not being rushed and I did not feel flustered.

☞ This is the classic human failure brought about by a little fatigue, a little winding up of the workload, a relaxed takeoff in the knowledge that neither crew member is being stretched anywhere near the limit of ability, and something which is done automatically time and time again. This is not complacency but it only happens after a level of skill has been developed where great chunks of the operation are accomplished in day to day operation without detailed thought processes being required. It is only more highly skilled operators who are open to this type of error. They are the ones capable of 'doing' without conscious thought about the individual actions that make up the action of 'doing'. Somewhere in the automatic part of the thought process a link is made incorrectly and the wrong control is operated. It is typified by the throwing away of the unwrapped toffee and eating the paper! Just be aware....

EVEN WITH THREE.....

● The co-pilot was under training (on a 4-jet heavy aircraft) and operating the sector in the Far East. This was his fourth handling sector. As a crew we were adjusted to local time and well rested. The aircraft was light so we had nearly the max. graduated thrust for take off (i.e. 1.50 EPR, 1.64 EPR would be full thrust). At about 90kts the engineer called "engine failure", the co-pilot called "stop" and the appropriate actions taken. However it was apparent that the aircraft was veering off to the right of the runway. At about 50kts I took control (normally this would be after the aircraft had stopped on the runway) and realised that the cause of the swing was no.2 engine still close to 1.50 EPR with the thrust lever advanced.

The consensus of opinion within the crew on discussing this afterwards is that the following series of events happened:-

1. No.2 engine had an EPR shortfall. 2. The flight engineer advanced no.2 thrust lever considerably ahead of the others to try to achieve the desired EPR. 3. The co-pilot who would normally advance the thrust levers to about 1.40 EPR for this take off and then allow the fit. eng. to fine tune them (while his hand rested lightly on the levers) allowed no.2 thrust lever to go ahead of his hand. 4. The engineer called "engine failure". 5. The co-pilot called "STOP" - but because of his hand position only closed Nos.1, 3, and 4 thrust levers. 6. I saw the co-pilot's hand move rapidly rearwards and "assumed" all thrust levers were closed!

We all learnt something that day and fortunately it was not an outboard engine, a wet runway or closer to V1.

P.S. An air safety Report was filed - however this might happen to someone else.

☞ Route training is always a difficult business not least because the failures in real life often do not conform to the "designer failures" of the simulator world. LOFT has made a significant contribution towards the general awareness of crews but this report shows that there are still surprises lurking out there.

SOME DO AND SOME DON'T.

● I have been using plot extracted radar for some two years now and some worrying shortfalls of this equipment are apparent.

Plot extracted radar produces a very clear picture of the air situation using symbols for different targets. The trouble is sometimes the picture is too clear!

Weather is nowadays processed separately and owing to lack of processor power in the displays cannot be displayed to the controller. This in spite of radars such as the ubiquitous Watchman providing 6 levels of weather intensity - all going to waste! Why can't this information be supplied somehow or even the excellent colour radar summaries used on BBC TV be made available? Don't be surprised next time you're vectored into cu-nim - we can't see them.

Equally this radar system doesn't always show aircraft very well, hence the need for transponders these days. A transponder is only useful if switched on, so pilots please squawk 4321, or ATC code, and controllers never, but never say "squawk standby", unless you mean it. I've seen too many aircraft disappear at a crucial moment because someone squawked standby!

☞ CHIRP is told that this technical criticism applies only at some of the radar displays and these are not the main consoles. There is an opposing point of view that the display should remain uncluttered to enable 'pop-up contacts' to be spotted immediately. Perhaps it would be nice to have the option of a weather display available to the individual.

PRECISELY!

● On the weather display on our electronic data display system (known as AFIS) the QNH was clearly displayed as 1001.4. On AT LEAST 2 occasions during one session, I passed the QNH to an aircraft as "100"4" (reading first and last digits).

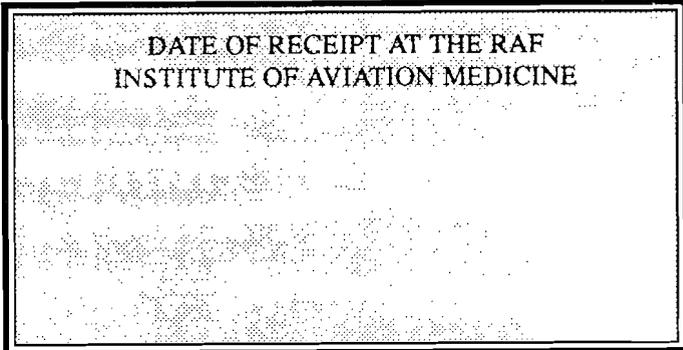
The question arises as to whether it is really necessary for MET to give us the pressures in tenths of a millibar, as we ALWAYS have to round it down to the whole millibar (sorry hectopascal!) before passing it to aircraft. This will become more important after 2nd July 1990 (when the RAF goes QNH only).

☞ Sounds to us as though a little bit of human engineering (fitting the job to the man) would fix this.

GUARANTEE NO RECORD OF YOUR NAME AND ADDRESS WILL BE KEPT

NAME _____
 ADDRESS _____

 PHONE No _____



We ask that you give your identity only to enable us to contact you if we are not clear about any part of your account. In any event this part of the form will be returned to you, as soon as possible, to confirm that we have received your report.

YOURSELF	THE FLIGHT	THE INCIDENT
CREW POSITION	DATE	TIME (PLEASE STATE LOCAL/GMT)
TOTAL FLYING HOURS	FROM:-	DAY/NIGHT
HOURS ON TYPE	TO:-	LOCATION
THE AIRCRAFT	IFR/VFR	PHASE OF FLIGHT
TYPE	TYPE OF OPERATION	WEATHER (IMC/VMC)
No OF CREW		

Please use this space to write your account. using extra paper if you need to

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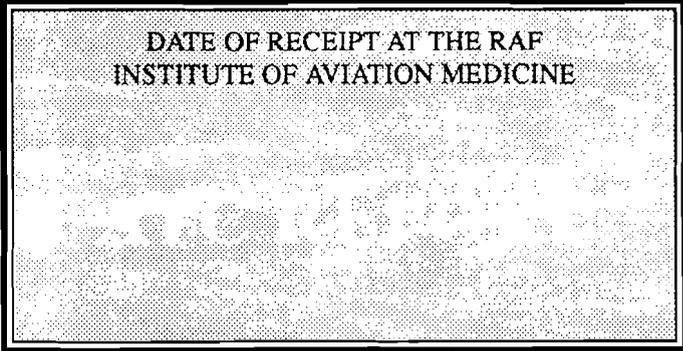
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YOURSELF	THE INCIDENT	
HOW LONG AN ATCO	DATE	ATC SERVICE(S) BEING PROVIDED
HOW LONG AT PRESENT UNIT	TIME	IN WHAT TYPE(S) OF AIRSPACE
ON DUTY AS	LOCATION & NEAREST REPORTING POINT	USING WHAT TYPE(S) OF RADAR
HOW LONG VALIDATED ON THIS POSITION	TYPE(S) OF AIRCRAFT INVOLVED	WEATHER
	AIRCRAFT IFR OR VFR	

Please use this space to write your account, using extra paper if you need to

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