9.0 A WORKPLACE PERSPECTIVE OF HUMAN FACTORS

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INTRODUCTION

The Association of Licensed Aircraft Engineers are very pleased to have been invited by the Civil Aviation Authority to make a presentation at this symposium. All too often people talk at us or about us and decide principle and practice on our behalf. Some of those people were once practicing maintenance engineers but rather more of them are not. Let us hope that the maintenance engineer will be given a higher profile in the future.

I am the legal representative for the ALAE. My remit is to provide advice and legal assistance to our members. I also provide counseling following maintenance incidents.

It has been very hard to gather views and opinions on the subject of human factors, despite having made requests for written contributions through our monthly magazine we have received very little. My presentation is based upon my own work experience together with a large number of informal discussions with practicing maintenance engineers throughout the United Kingdom.. In addition to this I have used some of the cases handled by me. This lack of response is not unusual from engineers and although I do know that the magazine is well read I did not expect there to be many replies.

Most engineers do not make errors, perhaps therefore they see no point in joining the fray.

We are moving towards a six hundred seat aircraft, the enormity of the consequences should any incident occur does not bear thinking about. There is rather too much at risk for us to fail in our application of human factors training and awareness in aircraft maintenance, likewise, and more importantly, in the training of our maintenance engineers.

I still have a gut feeling that we are not yet moving in the right direction.

WORKPLACE VIEW OF HUMAN FACTORS

The licensed engineer's view of human factors is clouded by cynicism often to the point where he dismisses the subject from his mind. Human factors is viewed by many as a means to allocate blame. There is inherent in these two statements a clear indication of the distrust of the science of human factors that is prevalent amongst engineers, a distrust that breeds the cynicism manifest in nearly every discussion I have had on this subject with engineers. The "blameless culture" that is currently in vogue is also distrusted and in any case is alien to the engineers "no nonsense" way of thinking. If something goes wrong there must be some accountability, some action must be taken. Provided the action taken was consistently fair it would always be acceptable. It is also felt that the no blame culture generates more error and incident than was previously manifest. I failed to meet anyone who could acknowledge that he was conscious of any human factors considerations when he was working. In every case the engineer was locked into what he was doing. There was also a clear opinion from any about the need to have consistent performance from management and better communication. This results from a decade of very unsettling restructuring, separate limited engineering companies, devolved maintenance etc. It is also very hard for the engineer to be objective when the spare he wants are never available, the training cut to the bone and the current changes in licensing not yet understood. These three views were frequently expressed to me.

THE MAINTENANCE ENGINEER

From the ICAO Digest 12, "the reliability of mechanical and electronic components has increased markedly over the past thirty years. People have stayed the same". This is simply not true. People do and have changed. Today we are dealing with a different animal.

We are all a product of our time, and in our employment we are a product of the culture and environment that surrounds us. The maintenance engineer is a product of the establishment, we would do well to ask what precisely we expect of this product. Social attitudes and education methods have changed considerably, the need to develop and maintain an enquiring mind is not so prevalent as it once was. This does not mean that today's engineer is less qualified or less able, far from it, but he does have a different outlook, sense of value and discipline.

In the UK we now have authorizations for "Limited & Simple" tasks. These authorizations are granted for some basic inspections (PDC) and for the replacement of a controlled number of components. This practice has proved to be a superb tool, the engineers accepting training and authorization have been very enthusiastic and are in no way cynical. I have found, however, that holders of such authorizations are not always wholly aware of the attendant responsibility that authorization carries.

CONTRACT ENGINEERS

Contracting of engineers is a growing business, the itinerant way of life is well liked. Most of those who choose this way of life are reluctant to change. Interestingly I have not handled a single maintenance related incident involving contract engineers, neither do we received any complaints concerning work content or environment. These engineers have a very real problem where training is concerned, they must either buy their training or take a permanent job to extend their authorizations. Their development is a separate consideration, but what of their human factor training. If human factor training is to be standardized across the industry then how are these engineers to be trained.

TRAINING

From the investigations and interviews I have conducted as the result of major and minor incidents I have come to the conclusion that specific human factors training would not have made any difference whatsoever, those incidents would still have occurred. What would have made the difference is training of a different kind. We need to train engineers totally for what we expect from them, technical competence is not enough.

So just how do we train our engineers? To start with we never train them so say no. The employer gives to technically suitable persons a type course, such a course in today's world is conducted in the shortest possible time. It is only from such a type course that an engineer will find himself in a position of real accountability and liability. The granting of authorization is a major change in the engineer's life, but how many are really prepared properly for such responsibility. The only information imparted on type courses is literal, a straight reproduction of facts on which to be examined. The thinking process required to investigate defects is not addressed, this probably being outside the ability of the instructor anyway, and the proper use of manuals is left to the student to work at. Authorization is duly granted and from then on the individual is, in the main, left to develop himself. He becomes a product of his environment, a product (the engineer) that is not subject to audit. His ability to cope, to develop a clear overview, the manage his team, to maintain a discipline such as to not make an error, remains in his own hands. Provided the on-time departure rate is good and scheduled maintenance goes out on time we continue to believe we are getting it right.

We do not look at ourselves when things do not go wrong.

Although I consider that type courses have been abbreviated to a dangerous level I have experienced only a very few incidents that were related to poor technical knowledge level.

I carried out a small survey to discover how many engineers were conversant with the JAR's and the company exposition, in particular the Terms of Reference for the accountable manager. Sadly very few had read fully the company exposition. I also discovered that very few had seen JAR's, and also that the JAR was, so often, not available in the workplace. My point being, that the certifying engineer should have a sound understanding of the need to support the accountable manager. Such philosophy should be accentuated in training.

The considerations to be made in the production of the competent maintenance engineer should be absolute. Technical training should be followed by personal development and human factors training, and greater emphasis given to understanding legislation. The different facets of training should not occur together, technical training should be carried out in isolation.

All of you would do well to bear in mind, when maintenance is complete and certified, at that point in time the signatory is the regulator, is quality assurance, is responsible for the maintenance package in hand, and if he does not perform to the highest standard and with integrity then the product will fail. This can easily happen with the best infrastructure, and has.

APPRENTICE TRAINING

An incident I investigated concerned damage to an aircraft for which the supervisor accepted responsibility. The damage was considerable and very expensive. The supervisor was working with an apprentice and therefore responsible for his training. He did, in fact, instruct the apprentice in a particular procedure that was incorrect. The apprentice faced with having to call for the procedure to be repeated on another aircraft, felt confident to carry out the procedure himself. This he did, and severe damage was caused. The important point to consider is not the engineer himself, but the apprentice. What other bad practices had this apprentice learnt. Apprentices in the workplace are allocated to engineers for work experience. This places considerable responsibility upon the engineer. The apprentice will be moulded in his attitude and practice by this experience. This again is a practice that should be subject to strict audit, and the selection and suitability of the mentor given particular consideration.

Inadequate training results in a good deal of arbitration between engineers on defects and procedures, one learns from the other's greater experience. This is certainly a very good thing as it will take about two years of practice to produce a competent engineer on type. But suppose they all suffer from poor training?

We never re-examine engineers at any time except for procedures. Once authorized it is taken for granted that they will be satisfactory thereafter, so the training must be right first time.

Another very good need for improved training is illustrated in Appendix 1. This article was written in response to a recurring problem addressed to the ALAE concerning the relationship between pilots and engineers.

PRESSURES

The greater number of cases requiring my assistance have occurred as the result of distraction and three of those (major incidents) involved the senior person in charge. The distractions were related to staff shortage and the lack of experience and good training of the licensed engineers under their supervision. The third case involved sheer volume of work. Two of these engineers were dismissed before the operator stopped to consider the deeper causes of the incidents. Evident in two of these cases was the need for the supervisor in charge to give considerable assistance to his engineers, reflecting again upon the quality of their training.

The ability of individuals to handle pressure varies considerably, and pressure is not something we train for. We are, however, expected to control those pressures.

Staff shortage for whatever reason creates huge pressures as does the need for on time delivery. All such pressures originate from the production side of the business, they have always been there and they will not go away. To be really competitive we run a continual race requiring us frequently to work on the edge. This is what makes this industry so exciting, it is certainly never dull. The inability to cope with such pressure has resulted in incidents with varying consequences. One thing however that does not vary, is that the person blamed will not repeat the error neither will they forget it. On the other hand there is very little evidence that the community at large will learn from the misfortune of others. So how do we learn from others.....

LITERATURE

I was a Health and Safety secretary for a large group of people for a term of five years. The H & S infrastructure of the company was absolutely superb, the literature available first class, and the training and support for reps, excellent.

So why did we have so many accidents?

The greater number of cases I handle for the ALAE are accidents at work.

Is human factors to go the same way, good infrastructure, good literature, good training, more incidents. There is a very real danger this will happen, people become inured to the subject. They see it so often they cease to take notice of it.

Consider carefully this symposium, this is the twelfth of its kind, perhaps we should now audit our performance in real terms and report at the next symposium some tangible results or stop meeting.

Like Health and Safety, Human Factors is a nebulous subject, and although the engineer’s mind works well with technical matters it does not work as well with legislative matters.

The presentation of HF material has to be managed carefully and must be acceptable. I sat in a crew room reading, opposite me was an engineer reading a human factors magazine. Quite suddenly he threw the magazine across the room. Curious, I picked it up and asked him to show me the article he was reading. Having read it, I too felt the same way. The author required speaking to, but the damage was done. The article was condescending to an infuriating degree, had it come from another maintenance engineer, however, I am sure the response would have been different.

The never ending "this is how **you** should behave" method of approach would be improved by "this is how **we** should behave".

Much of the material is good, but it is not having any significant impact. This is possibly because it is so distant from reality, and engineers do not think about it when they are working. Most importantly, from what source is this material derived. Referring back to my introduction yet again, the engineer is being spoken at by people who do not carry out maintenance.

Teamwork has been one of the "in vogue" driving phrases so well used of late. Teamwork suggests a partnership, now that would be nice. Some educated direction by all means, but do not talk at us. Remember, we too have something to contribute. We are the people carrying out the maintenance and when we make a certification or sign a certificate for release to service, that is where the buck will stop.

APPENDIX 1

Engineers vs. Pilots
by
G. Evans

As we are about to talk at length about the relationship between Pilots and Engineers, I pause to wonder just how they see us.

There are only two people in aviation, the engineer and the pilot, all the others could do their jobs in any other business. These two people are required to be examined and licensed and are accountable in law for their actions.

But how do they get on?

They only come together during operations, that is when the engineer is working on an aircraft that is due to fly or when an operational aircraft is defective. The engineer may require to impart information to the crew as the result of a maintenance function, such information being referred to a maintenance manual or procedure, fairly straightforward. The crew may want to debrief the engineer on a particular defect or discuss a recurring problem, again straightforward. Suppose, however, there should be a departure defect or perhaps the crew have a particular question they require to be answered. There should be some caution exercised here; walking into a flight deck and answering questions off the top of your head is a risk.

Let us suppose that you should give incorrect information, the consequences could be embarrassing, and in any subsequent inquiry there would be two flight crew giving evidence and one of you.

It is taken for granted that engineers are an available source of reference for flight crew, but there is nothing in law that requires the engineer to answer flight crew questions, it is something that is, quite simply, taken for granted. The requests for assistance and information when the aircraft is airborne raise more poignant questions.

The training of engineers and flight crew has been abbreviated to such a degree that the need for pilots to ask questions has increased and the ability of engineers to respond has decreased.

So where do we go from here …….

Well quite clearly the communication between engineers and pilots must be maintained, it is too important, but there must be safeguards. In the first instance do not allow yourself to be pressurised, if you are unsure then say so and take reference. Reference can either be from a maintenance manual or written procedure, this would provide adequate verification. Asking another engineer and then imparting that information just might compound the problem unless he is prepared to talk to the crew himself. Engineers who have not at least two years experience on type should be particularly cautious.

Experienced pilots converting to another type tend to ask all the same questions we have heard before, and there is attendant with such pilots, another problem. They have trouble disengaging their minds from the previous aircraft type they operated.

Caution should be exercised when listening to the question being asked as it may not relate to the present aircraft type. This confusion can also occur where the pilot is flying two aircraft types seen by him to be alike, but to the engineer very different. For example, same switches and lights but totally different circuits.

The pilot actioned PDC constantly raises queries, one sometimes wonders just who trains pilots for this function. (Interestingly the JAA do not seem to place any importance whatsoever upon this function). Engineers, at present, give support for PDC but they may not be there in the future, pilots beware ……..

It would be most useful for pilots and engineers to meet regularly and to maintain a healthy rapport, there is so often a difference of opinion which serves nobody's interest. The attitude of pilots to engineers and the demands made by pilots leave much to be desired. With some it is a singularly pleasant and useful exchange, with others somewhat less so, and no doubt they see us in a similar light.

But the bottom line is, if you do not want to answer pilots' questions then you don't have to, you are not and never have a source of reference for pilots and neither are you paid for this function. Should any of you have Terms of Reference that specify a requirement to answer pilot queries then be sure that you, and not your employer, retain control of this function. Do not hesitate to say "no", or "please wait", do not allow yourself to be pressurized.

A contentious article, something you have not thought about before, something perhaps you should think about now.

Your views are invited……..