

ISTC Presentation

Technical Communication in the air environment (Slide 1)

Or

More simply, Plane Writing!! (Slide 2)

But first, some important notices: (Slide 3) In case of emergencies the emergency exits are there, here and here, in case of turbulence please tighten your belts and if your neighbour falls asleep please feel free to elbow them in the ribs!

Greetings, I am Gene Sexton, Head of Technical Publications for QinetiQ at Boscombe Down. An ex Royal Air Force Aircraft Engineer I have been in Technical Publications for around ten years now, first as a contractor, then with Westland Helicopters and from there to QinetiQ.

QinetiQ, Boscombe Down operates a fleet of 19 different types of aircraft, ancient (slide 4 Harvard) and modern (slide 5 Tornado). Small (slide 6 Chieftain) and Large (slide 7 BAC 1-11). We also design and build a variety of equipment for an even wider range of platforms across an impressive customer base. But most of that is confidential and if I told you about it I'd have to shoot you so we'll give that a miss for now! And I'll give you a very quick introduction to the company as a whole instead.

So there now follows a (Slide 8) Commercial Interlude

(Corporate presentation)

1. (Slide 9) This is Head Office at Farnborough, where all our fat controllers work!

2. (Slide 10) Now this is what we are all about. We are now essentially a private, or rather public listed company but the 6 decades experience quoted here clearly encompasses the majority of our history which was as part of the MoD Defence Evaluation and Research Agencies and all its previous incarnations.
3. (Slide 11) As you can see here I am but one of over 11000 talented people, I would like to emphasise the word talented. It is those very talents that enable us to deliver a range of innovative, cutting edge solutions to an array of customer requirements.
4. (Slide 12) Our heritage is based within the UK and we have 40 sites throughout the country, but in recent years we have expanded our reach to acquire six high tech companies across the United States.
5. (Slide 13) Our major work is in the area of Defence and Technology and we provide massive support, as you can see, to our Armed Forces.
6. (Slide 14) These are just a few examples of our Defence expertise; The VAAC Harrier you see here achieved the Worlds first automatic landing on a moving ship. You may well have seen the same aircraft on TV last month, when a journalist who can't even drive a car, flew and landed the aircraft using QinetiQ's Active Control System.
7. (Slide 15) Of course, much of the technology developed by QinetiQ is bound to have more than one application and we now have an impressive portfolio of dual use technology solutions covering a range of adjacent commercial markets.
8. (Slide 16) TARSIER, for instance, continually scans airport runways for potentially dangerous debris. It is possible that had this system been in use at Charles De Gaulle airport on the 25 July 2000 then the Concorde disaster would likely have been prevented, as the system may well have detected the titanium strip that fell from another aircraft which took off 4 minutes before Air France Flight 4590. It was this strip that burst the Concorde's tyre, debris from which then pierced the wing tank causing the fateful fire and subsequent crash, killing 113 people.
9. (Slide 17) I've already said that we now have a very effective foothold in the United States which provides us with an important route to U.S markets for U.K research and Technology. We have as you would expect focussed on areas within the U.S that complement our existing strengths.
10. (Slide 18) Here are a few examples: I particularly like TALON, developed as a bomb disposal robot, it can now be used as a weapon to help keep our troops remote from danger. I'm sure it

will soon be further developed to encompass everyday household chores, like vacuuming and dusting to protect our footballers Wives And Girlfriends, and the more domesticated among us, from housemaids knee!!

11. (Slide 19) And that was a very brief introduction to QinetiQ.

And so to another story!!

I'll start with

(Slide 20) **A little bit about me**

As an aircraft engineer I worked on Her Majesties aircraft, (Slide 21) you can use the term 'worked' as loosely as you like, I had to use the Technical manuals continuously for all aspects of the job. I also used to complain continuously about the way they were written and the inaccuracies they contained.

There was a system in place, which I have to admit I seldom used, for reporting back problems or inaccuracies in Aircraft Publications. But perhaps I had, well, a certain arrogance as a young man and felt that I had more important things to do than waste my time filling out yet another report, and I would just get on with fixing the aircraft. Of course now, I have a *confirmed* arrogance, as an *old* man and, I would..... Probably still feel that I have more important things to do! **BUT IF SOMEONE DOESN'T DO IT AN AUTHOR CAN'T PUT IT RIGHT! SO IT'S SIMPLY A CASE OF DO AS I SAY, AND NOT AS I DO!**

Throughout my 22 year career in the Royal Air Force I had experience of the wide range of manuals required to operate, maintain and repair aircraft, their systems and components.

On the flight line at Lyneham: Maintenance and Servicing Manuals, Flight Servicing Manuals, Safety and Servicing Notes, Illustrated Parts Catalogues, Scheduled Maintenance Manuals and more besides.

In the Servicing Bays at Odiham: Bay Servicing Manuals and Schedules, Component Servicing Manuals and more illustrated parts catalogues, can you imagine how many of these there are by the time you've assembled a whole aircraft? That's right, Shed loads!!

(Slide 22) As an example, this is about half of the manuals required to operate Alpha Jets!!

(Slide 23) As a better example, this is a Tornado aircraft together with its supporting technical publications. These are now stored on disc but that doesn't look anything like as impressive! THE FACT IS, OF COURSE, THAT JUST AS MUCH AUTHOR EFFORT GOES INTO PRODUCING IT, but then you already knew that. I really must think about who I'm talking to!

On Aircraft Servicing Flight at Waddington, there were loads more manuals, and more Illustrated Parts Catalogues, so many Illustrated Parts Catalogues!! The list goes on!! And when I returned to Lyneham to take up Hercules Ground Engineering with this lot, (Slide 24) now there's a fine body of men, on these, (Slide 25) I had to be aware of all the same books for another 3 trades on the aircraft as well as gain familiarity with **all** the Aircrew books...

Both of them!!

It's enough to put you off reading for life!!

So why do I do it?Now I ask myself that question I haven't really got a clue

Seriously, though. I clearly now have a far better understanding of the difficulties and effort involved in producing good, accurate, Aircraft Technical Publications, I know that some of my colleagues would dispute that! So for their benefit I will repeat it. I clearly have a, oh to hell with that, let me talk a bit more about Aeroplanes and Aircraft Publications, after all, it is the single most important area of Technical Communication there is! I know, most of you want to disagree with that, and we are all a bit precious about our own areas, but as I have the stage at the moment you'll have to put up with my, completely unbiased opinion!

We'll start with a bit of history.

Since the dawn of time, man had longed to fly. Since sighting the first bird on the wing, man has dreamed of soaring through the air, we have all heard the story of Icarus (slide 26 HMS Icarus) No, not that one, this one! (Slide 27 Icarus) (I couldn't bring myself to include the pictures of him crashing). I don't know if you are aware but someone has actually taken the trouble to write an accident report on the Icarus incident!!! Anyway, I digress. We are just never satisfied with what we've got and so:

Once upon a time some aeroplanes were built (slide 28) in order to satisfy those longings. The designers knew all about it, ALLEGEDLY, but their customers didn't.

They didn't know how to fly them (slide 29), come to think of it the designers couldn't fly them either; (Slide 30) this, incidentally, is believed to be the first passenger fatality in an air crash Orville Wright was piloting the aircraft when it crashed, he suffered a broken leg and ribs, but his passenger, Lieutenant Thomas E. Selfridge of the United States Army, sustained fatal head injuries.

They didn't know how to maintain it (slide 31) and they didn't know how to fix it when it broke What was needed was for technical information to be communicated in a way that could be understood and applied to address these problems.....hmmmm.

We could get authors to (slide 32) write about them but authors might not understand the technical information and drawings to put into language the users would understand. We could get designers or engineers to write about them, and they like to think they can, but as we all know, designers (slide 33) only really understand pictures, and engineers (slide 34) only really understand numbers and equations. What should we do??????

A period of intensive cross breeding followed until, at last, the perfect specimen was created. The Technical Author! (Slide 35) Recognise him?

Let's face it; we're not exactly rocket scientists!! (Slide 36)

SO

Authoring in the Air..... (Slide 37)

Well, not actually in the air but in the office (Slide 38) about and for the air environment. This is my department. You see that plant just to the left of centre? He's in charge while I'm at this conference!!!!

In common with all other authors we have to begin with an information gathering exercise, research. Even novelists need to research their subject matter, but they of course have a licence to do what technical authors can't and that is to make stuff up!

Ours are works of non-fiction; they are not great works of art or literature, they are not beautifully phrased prose. They are, for the most part, working documents upon which others rely for their accuracy.

If we get it wrong there is the potential for others to get it wrong: Technicians, Aircrew, crew chiefs, aircraft handlers, Flight Line Mechanics and independent checkers. In fact a whole range of people are wholly reliant on our ability to get it right.

If a Technician does something as simple as to (Slide 39) install the rivets incorrectly in a wear strip, or manufacture that wear strip from the wrong materials it can have the kind of disastrous consequences that I mentioned earlier resulting in the catastrophic loss of the aircraft and more importantly. Lives!

Now the accident report on that particular incident did not find that the Aircraft Publications were at fault. It actually found that the strip was manufactured from the incorrect material as well as being installed incorrectly in spite of accurate instruction in the manuals.

We cannot of course legislate for people ignoring clear instructions. But it does highlight the fact that it is our responsibility to make the instructions clear and unambiguous, even to the ignorant!

The fact is that you won't find many aircraft incidents where the fault is found to lie with incorrect or inaccurate information in technical manuals. It is more usual to find that Technical instructions were ignored or not even read, and there can be many reasons for that, i.e. familiarity or complacency, sometimes even pressure to get the job done resulting in a perception that you don't have time to read the manuals.

You will, however, find some accident reports that say that the Technical Manuals were 'confusing'! We come back then to the clear and unambiguous.

As technical authors we really can't legislate for engineers and other end users not reading the manual; that is down to various other factors; self discipline on the part of the tradesman, education, engineering

management and the like. **But**, what we must do as technical authors in the air environment is to make those manuals clear and unambiguous.

We have to take a huge amount of confusing specification requirements, design files, drawings and related changes, hazard and safety information, COSHH, aircraft standards, publication standards and so on and so on. Then we have to turn all that into very clear, very concise, unambiguous Technical publications that don't burden the end user with a ton of extraneous information that is of no value to them in the pursuit of their task. (Slide 40) In other words: don't overload the user with unnecessary information!!

All the aircraft tradesman wants to do, in simple terms: is diagnose the fault, remove the faulty item, fit a serviceable item, functionally check the system, sign the paperwork, get a cup of coffee and move on to the next job.

It is our responsibility to make sure the tradesman can do that.

All the Pilot wants to do is: the Times crossword, check his flight plan, climb in his aircraft, get the ground crew to do up his seat belt and make sure he's sitting comfortably, start the engines and go and punch holes in the sky.

When he gets bored with that, he wants to be able to come back, drive his aeroplane along the White lines until he sees the ground crew with the ping pong bats who will show him where to park, refuel his jet, clean the windscreens, fix the bits he's managed to break, and leave it serviceable so that he can go and do it all again tomorrow!!

It is also our responsibility to make sure the Pilot can do that.

We would prefer that he never has to do this. (Slide 41) But we tell him how he can just in case he breaks the aircraft badly enough that it won't get him home! We don't, however, have to instruct him on how to carry his bags because there are other people to do that for him with no instructions at all!

And if we don't tell cabin crew which handle to use to open the door then this (Slide 42) can happen!

If you didn't pay attention to my introduction, then you will now be in no doubt whatsoever, from this shameful display of bias, that I am an ex aircraft engineer, no offence is intended, it's just that I come from the Jeremy Clarkson School of presentation humour! And if our aircrew colleagues can't take a joke, then it's not my fault!

Anyway, back to the serious stuff

Most places

In many organisations that produce Aircraft Publications the technical author will be given a limited number of subjects, or topics, to author, usually in a field that he could be considered a specialist. If the author was a mechanical tradesman in a previous existence then he will usually be allocated topics that relate to that speciality, if he were an electrician then he will be given electrical maintenance topics and so on.

In very simple terms:

If it is a new aircraft or system then all the design information, technical data, system descriptions, specifications and drawings will be analysed. And documented, in words and pictures, in a logical fashion that will enable the end user to understand exactly what is required to recognise, operate, diagnose, examine, remove, repair, refit, test and any other verb you can think of, to make and keep an aircraft safe and operational.

God we're good!!!

If the aircraft is already in existence then there will always be improvements and modifications to it, requiring consequent updates and amendments to the aircraft manuals.

Each system on an aircraft usually requires a description and operation, maintenance instructions, removal and installation instructions, functional tests and so on.

Whilst constructing this array of instructions and tests there are many more issues to consider than just the instruction or operation that is to be undertaken by your reader.

Most of these other issues are concerned with his or hers health, safety and general wellbeing whilst undertaking the required task.

We attempt to cover all eventualities to prevent the tradesmen injuring themselves or others. Otherwise the provisions of the health and safety at work act may conspire to deprive us of our liberty.

(Slide 43) The Health & Safety at Work Act 1974 infers that it is the responsibility of the designer to ensure that sufficient information is available for the safe operation, maintenance and disposal of any equipment designed.

(Slide 44) Penalties for non-compliance are severe, including custodial sentences for serious breaches of the law.

We must therefore, always consider warnings and cautions that are required when giving instructions. It is common to end up with an extensive list of both.

Warnings alert the user to anything that might cause injury or death, this includes substances that may be toxic or flammable, harmful voltages, actions that could cause damage to eyesight, and equipment that may emit noise that could damage your hearing.

These are just examples. A relatively simple operation and maintenance manual that we have recently written required the inclusion of no less than 37 separate warnings.

Cautions are used to draw attention to anything that might cause damage to equipment. That same manual required 27 separate cautions.

As I've said, and then waffled on a bit. In most places that produce Aircraft Technical Publications. The Author will have a limited number of Systems or Topics to deal with. They will usually have one style and specification to deal with and the required common templates will usually have been set up for them. He, or she, in effect specialises in those areas, and that is a good thing as it makes for consistency of output.

However, when you are: (Slide 45)

Authoring at QinetiQ.....good to see the plant is still in control

Yes, actually at QinetiQ, then we have to take a broader view. Our primary purpose is to support the QinetiQ fleet of aircraft.

What that means in simple commercial terms is that, unlike many other establishments, it does not generate a visible income stream for the company.

It is a cost that has to be born in order to fulfil our airworthiness obligations to support our aircraft and operate them safely.

That has two effects, one is that we can't afford to employ vast numbers of authors to carry out these functions, but for that reason the second effect is that the job at Boscombe can be far more interesting than at many other places.

That does not mean that Authors from other aircraft establishments couldn't do the job, they most certainly could, because technical authors are very versatile, adaptable and wonderful human beings.

But as I've said, there are relatively few of us, and there are 19 different types of aircraft to support, as well as a variety of other equipments. We therefore need to adopt a very flexible approach and be prepared to cover the whole range of aircraft topics and subjects, particularly for aircraft that are no longer supported by the original supplier, or the Ministry of Defence.

This then gives us the opportunity to cover almost the full gambit of the aircraft publications suite, from the Flight Servicing Manuals, to the Flight Reference Cards.

(Slide 46) So we can go from working on the maintenance procedure to inspect the structure on a Harvard one week, (Slide 47) to writing the Flight Reference Cards for a Tornado the next.

Because many of our aircraft tend to have unique specialist modifications fitted to them. (Slide 48) Our Active Control Harrier that I spoke of earlier for instance, it is necessary to have specialist, one off Technical and Aircrew Manuals, and Flight Reference Cards for them.

I said previously that our primary role was in support of the QinetiQ Fleet. Allied to that is support for our Design Office. As I'm sure you are aware, we don't really operate a fleet of 19 different types of aircraft just so that aircrew can go and punch holes in the sky.

(Slide 49) Yes, we are home to the World Famous Empire Test Pilots School, they like to do that, and some of the fleet is there almost entirely for their benefit. It is a hugely important part of the operation here and makes a massive contribution to the world of aviation.

But we operate the fleet so that we can test and evaluate the wide variety of cutting edge technology solutions that our design office is tasked to produce.

Some of these can of course be fitted directly to the customers aircraft for trialling but a considerable amount of the designs that are produced require an extended test and evaluation program at Boscombe Down, and for that purpose we fit the system or equipment to our own aircraft.

A prime example of this is our technology demonstrator (Slide 50) which is a specially-prepared integrated avionics research Tornado, in new generation single-seat configuration; also (Slide 51) our extensively modified two-seat research Jaguar gives us an airborne platform for development and evaluation programmes, including customer demonstrations. I have already mentioned the Harrier.

(Slide 52) This is Snoopy, sadly now retired and I only show him because he's my favourite, but we also have Europe's largest and best equipped research and development air fleet, (Slide 53 Andover) with a variety of 'flying laboratory' aircraft that give us comprehensive test and evaluation facilities. (Slide 54 BAC 1-11)

We also test avionic and communications system line replacement items (LRIs) in our compact and self-contained Avionic System Test Facility, without the need to bring in extra test equipment.

If it needs fitting to one of our fleet aircraft, it needs the relevant documentation to support it, and the great advantage of being on site is that we have complete access to the aircraft and we can be involved from a projects inception.

We are present at the estimating phase to advise on the technical documentation required to support the equipment and the aircraft, we also review the system requirement documents and are able to identify, advise on and produce all the required additions and changes to the technical publications.

These can be just minor changes or simple modification leaflets. They can be major changes that require considerable amendment to adopted manuals, or they can be full blown supplements to the existing suite of publications.

Whatever the requirement, the changes are all carried out in the manor, and to the standards and procedures that I mentioned earlier, following a robust quality process which of necessity includes something that I haven't previously mentioned.

Validation

All authors will know the value and necessity of documentation review and in the air environment this is no less important. In fact, once again I will dare to say it is far more important and goes far beyond simple peer review and editing.

When we have written a functional test procedure, a removal and installation procedure or a set of actions for the Flight Reference Cards we have to know that they will work when used in anger. So the value of validation cannot be overstated.

We have taken an enormous amount of information, as I described earlier, stripped out all the unnecessary information, added Warnings and cautions, organised it into logical steps, probably cross referenced it to various other areas and condensed it into a technical document, targeted at the end user so that he can carry out his task with **all** the information that he needs and no more than he needs.

That is all very well but we now need to verify our interpretation. For that reason we need an effective validation process. Of course we need consistency of styles and formatting, that can be easily achieved using a peer review process, and we do.

But we have to think about whether we have missed any airworthiness implications, about whether all supportability and maintenance requirements have been met. And, we have to know that the instructions that we have written are consistent with the original design and the system requirements.

Our processes have to cover all that and identify who our instructions should be reviewed or validated by. Aircrew Manuals and Flight Reference Cards require checking by aircrew and signing off by airworthiness specialists. Maintenance, Flight Servicing and Functional Testing Procedures will need checking by maintenance personnel. New removal and installation instructions or full system functional checks will often require a full practical validation whereby a tradesman with the author or his representative present will carry out, step by step, the actual task on the aircraft in exact accordance with the new written procedure.

If it is newly designed equipment, then the designer will need to verify that what is written complies fully with his design and the system requirements. These activities are the final assurance that the technical publications are fit for purpose, and only when they are fit for purpose will the final validation certificate be signed so that the technical publication can be issued to the relevant end user.

In Conclusion.....

Where would the World be without us? Men and Women of skill and conscience who write the books that keep our aircraft, crew and tradesmen, safe from danger.

As long as they read the confounded books that is!!

I am sure that aircrews read Flight Reference Cards, particularly the emergency section which I imagine they know better than their Mums cooking, because their lives may depend on them. I know also that they will tell you if they think there's a problem with them, that's great, I have no issue with that.

Now ground crew will read them also, and before you start we don't need jokes like 'as long as there are plenty of pictures' even if it is true! They will be used all the time as long as they really are fit for purpose. And that is: relevant, accurate, concise, clear and unambiguous. They neither need nor want beautiful works of literature in pursuit of their task. They simply need clarity. That's all, is that really too much to ask of us? I don't think so.

And finally, (Slides 55, 56 & 57) with a view to clarity for all, I have brought this recent invention along. **Press button** my screen cleaner

Because clarity is our goal, and I think we've got it licked!!