Expanded Transcript of PACTS Presentation.

What sort of airline pilots do we need? And where will we find them?

Introduction

This Presentation, given on 19th January 2012 in Portcullis House, was based on a paper written for the Aviation Safety group by Ian Frow with assistance from Chris Seal.

To know and understand the present and the future, it is also necessary to know and understand history. This Presentation was designed to provoke discussion by briefly discussing aviation's historical attitudes to safety, and its approach to the recruitment, selection and training of pilots.

The first part of the Presentation attempts that task. The second part poses a number of questions on the future recruitment, selection, training and employment of airline pilots without necessarily providing any answers. The object was to spark an informed debate.

The views implied within the Presentation are those of the authors and do not necessarily reflect the formal position of any of the groups with which they are both associated.

Note: *In March 2012, the RAeS is due to stage a two day conference entitled 'The Aircraft Commander in the 21st Century' which will no doubt cover some of these issues in much greater detail.*

Confounding a safety paradox

There is a paradox in the use of aviation for public transport. No matter what statistical method is used to measure its performance, Civil Aviation has become one of the *safest* forms of public transport. The paradox is that aviation is also *fundamentally dangerous* because, unlike other forms of public transport which effectively operate in two dimensions, it uses the third, *vertical,* dimension. Civil Aviation's use of three dimensions introduces risks and dangers not present in other transport systems and yet it is very safe indeed.

Motoring and aviation developed within decades of each other yet a comparison of their respective initial death rates shows that early aviators suffered appalling losses compared to early motorists. Between the date of the Wright brothers' first flight in 1903 and the start of the First World War in 1914 more than 1000 pilots were killed in fixed wing aeroplane accidents. Similarly in both World Wars more pilots, on all sides, were killed in accidents than due to enemy action. The main causes of death were mechanical failure, stalling and spinning.

Aviation could not tolerate this carnage and quite early in its history it devised what could be called a 'Virtuous Safety Circle'. All accidents were carefully investigated and the causes established. Using this information changes were made to the machines and operating procedures and new aircraft designs and procedures were modified using this knowledge.

Subsequently it was appreciated that whilst Human Factors were part of the problem they could also be part of the solution. A study of the data from three recent accidents and one major incident illustrate this. On the one hand, the crews of the Air France A330 accident and the Colgan Air accident in Buffalo undoubtedly contributed to the problem; on the other, the Qantas crew in the Singapore incident and Captain Sullenberger in the Hudson River ditching supplied the solutions to massive technical failures.

Aviation initiated a regime of initial Training, Examining, and Licensing and followed this up by regular (six monthly) checks on pilots' and other crew members' professional competence and medical fitness. The lessons learnt from accidents (and in recent years from incident reporting) are applied to this training and checking. In addition there has been substantial research on Human Factors on the flight deck. Aviation thus also has a Virtuous Safety Circle operating within its aircrew management.

Since 1944, aviation has also had international standards set by the International Civil Aviation Organisation (ICAO), a division of the United Nations. The United States Federal Aviation Authority and, in Europe, the European Aviation Safety Agency amend and expand ICAO's standards.

Remarkably, this effort to learn from accidents and errors and to use the knowledge to improve the quality of the product (in aviation, safety) is rarely replicated in other professions or industries. Medicine, the Law, the financial industries and many others make mistakes which can kill or ruin. They rarely carry out investigations with the detailed intensity of the UK Air Accidents Investigation Branch and so frequently repeat their catastrophic errors. The only exception to this laxity is when there is a chance of legal action being taken against them.

Note: In very limited areas, notably in operating theatres, in the past ten years Medicine has started to copy Aviation's Human Factors procedures. It still does not use Aviation's regular routine checking of performance or rigorous investigation of all accidents and major incidents.

Currently flying is 300 times safer than it was in 1960, twice as safe now as in 2000. Thus this historic, careful and expensive activity has enabled Civil Aviation to create that paradox of being fundamentally dangerous and yet, in practice, extremely safe.

Note: The industry must however beware hubris since in 2011 there were 32 fatal accidents in 2011 compared with 26 in 2010 and a decade average of 31. The warning for the future lies in the fact that the majority of 2011 accidents were in small regional operations where inexperience and overwork often coincide.

History –Training

The RAF Central Flying School (CFS) was founded in 1912 but was initially woefully underpowered but started to improve by the end of WW I. Its development continued in the 1920s and 30s until the pressures of WW2 accelerated its more scientifically based training methods. Subsequently it has become the Gold Standard institution for training Military Instructors.

When passenger carrying Civil Aviation started in 1919 any pilot could teach others to fly. This situation continued in the UK until 1931, when the Guild of Air Pilots and Air Navigators (GAPAN) set up an examining, licensing and regulating scheme for instructors. GAPAN continued with this function until 1967 when the Civil Aviation Authority (CAA) took over. In the meantime the airlines had selected, and often only cursorily trained their own instructors until eventually the CAA took over the role of examining and regulation. However until the present day there has never been any equivalent in Civil Aviation of the RAF CFS. All instructors training is still largely ad hoc and 'learning from experience' interspersed, in the better airlines, with a variety of occasional courses.

There is no industry wide standardisation on instructional techniques and the CAA's role is merely to ensure that instructors carry out their examining duties to the correct legal standard. ICAO does publish some rather vague training standards but these are not in any detail. The current move of most regulatory functions to Europe under the European Aviation Safety Agency (EASA) might be an opportunity to set up a European Civil Aviation equivalent of CFS.

Selection– then

Sir George Cayley decreed that his coachman should test-fly his experimental glider in 1853. Following the inevitable crash the coachman resigned with the words 'Sire, I was employed to drive not to fly.' Apart from this unfortunate man all the early aviators were self-selected and perhaps a little mad.

By the start of WW1 potential pilots were selected on the basis of their possible previous experience, their 'sportiness', 'good seat in the saddle' and the school they had attended. There was a heavy emphasis on physical fitness. The death rate was dreadful and, apart from the inevitable accidents due to mechanical failure, the majority of accidents were due to pilot ignorance and incompetence. Stalling and spinning were little understood. (It is sobering to note that at least two recent major fatal accidents have been due to stalling).

Immediately post WW1 the first airline pilots were ex-military but by the time Imperial Airways was formed in the thirties its pilots were a mixed bunch with no obvious selection policy. Ironically as Imperial Airways (IA) opened up its long distance routes these pilots were given immense authority including commercial decisions. On arrival at an IA

outstation an IA captain took over as manager of that station. (This elevation did encourage the 'god complex' for which these men were famed even after WW2.)

At the start of WW2 the Service pilots were initially pre-war pilots both civil and military. The demand rapidly exceeded supply and the selection and initial training was woefully inadequate and the accidental death rates were appalling. This forced a rapid improvement in the scientific basis for Selection and Instruction. Post war the airlines were staffed by mainly ex-Service personnel who had benefited from these improvements. The airlines' own selection procedures were erratic and leant heavily on the fact that most candidates had already experienced military selection/training.

(Ian Frow: *My selection by BOAC consisted of a couple of rambling interviews, a medical and an hour in the four piston-engined Stratocruiser simulator – a massive leap from the single jet engine RAF Vampire I had been flying.)*

Meanwhile the Services continued to refine their selection procedures to the standards now applied at RAF Cranwell. The advent of airline sponsored schools at Hamble, Perth, Oxford etc. meant that fairly consistent selection standards were applied. Thus post WW2 until 15-20 years ago the main sources of Civil Aviation pilots were the Services, Airline schools and Schemes, plus a number of 'Self Improvers' who financed and organised their own training perhaps making up 20% of the total of new Civil Aviation pilots.

Selection Today

Although there is still a trickle of ex-service pilots entering Civil Aviation and the prospect of some airlines starting up ab-initio training schemes, the majority of new pilots entering Civil Aviation today are in most respects, 'Self Improvers'. Indeed today the 'Self Improvers' may well have reversed the percentages and could now make up 80% of the total of recruits.

Many 'Self-Improvers' are those who start their flying in club/sport aviation and, usually self-financed, take courses, training and exams until they have the required qualifications for an airline position. Their initial training can be haphazard and with long gaps whilst additional finance is raised. (Recently the authorities have tightened up the requirements for the type of flying eligible to count for the issue of a licence).

Note: Many prospective pilots have obtained many hours of experience in their teenage bedroom 'flying' computer simulations. This experience is quite good training for much of modern automated Civil Aviation operations. It has, however, little relevance to non-automated flying and manual handling.

These pilots' final line training experience may need to be obtained with an airline which does not employ them but which in a variety of ways actually charges them for the training to obtain a full qualification.

Other 'Self Improvers' obtain the necessary finance (up to £100K) and buy their training with one of several large commercial flying training organisations. Often such financing involves taking out loans which make University loans look puny. Worse, unlike University and other academic training all flying training is subject the 20% VAT rate.

For those following the 'Self Improvement' route there are no qualification barriers for entering the profession of Civil Aviation apart from the ability to pass the medical and the appropriate licence exams and practical tests. Unlike earlier Service/Airline selection procedures, there may be no checks on Education standards, no previous flying experience requirement, no handling ability checks, no personality profiling, no assessment of leadership potential /business acumen. Although some of the larger commercial flying schools do put their potential pilot customers through selection tests, this is not universally true. Others simply require these would-be pilots to demonstrate they have the money.

Note: The GAPAN Assessment Scheme, run in conjunction with RAF Cranwell, enables would be pilots, for a modest sum, to have an assessment of their suitability for qualifying for professional licences.

The processes by which airlines select their pilots are many and varied. Some will select based on an interview and presentation of the correct paperwork when 'Contract' work will be offered. Others use isometric and psychological assessments plus ability tests in a simulator. There is no set standard for pilot selection apart from the requirement to have the appropriate licences and ratings and all too often selection standards vary depending on supply and demand.

Training Today

Most ground school work is based on self-activated computer programmes with very little input from a human instructor to add experience to the bare facts. Initial handling training can be on a variety of aircraft categories ranging from ultra-light aircraft to aircraft specifically designed for flying training. The instructors involved may have only just achieved a full instructors rating and may themselves be relatively inexperienced. They may well be building up their hours towards their own licences. This is not the case in the larger flying schools where the instructors will be well experienced and professional.

Note: Many experienced pilots would confirm that the first ten to twenty hours of flying instruction was the most important of their career. If those hours are spent with a high quality instructor disciplines and techniques are learnt which will be used throughout a flying career. Conversely a poor instructor can instil bad habits and discipline and create a pilot who will struggle to maintain standards throughout a career.

Modern simulators can be most useful tools in instruction but the balance in hours between learning in a simulator versus a real aeroplane needs to be carefully monitored (there is currently substantial research investigating the whole subject of simulator training). Additionally, there are current attempts to 'rate' the quality and relevance of flying hours in terms of experience for the issue of licences. For example, flying hours obtained in cruising level flight have much less practical value than those obtained flying circuits and landings.

Recent accidents have highlighted the inability of younger pilots to cope with handling an aircraft in unusual attitudes whilst on instruments. Similarly recovery from high altitude upsets may well need more training. Should aerobatics be a compulsory part of training for commercial pilots' licences?

Selection Tomorrow

If some forecasts are to be believed the number of new aeroplanes on order will require a substantial pilot recruitment in the next ten years. However to quote Kent Lovelace, Chairman of the University of North Dakota School of Aerospace Sciences*, "The days of having an unlimited supply of young people having an interest in becoming a professional pilot with an airline are coming to an end… The truth is that most airlines are not concerned about it because they have never had to be concerned before".* He was referring to the US situation but his remarks are valid for Europe too.

The sheer number of pilots potentially required may well mean that standards will have to be lowered. This poses a number of questions:

Does Civil Aviation still need to require that all its pilots have the skills of Captain Sullenberger (of the Hudson River ditching)?

Those joining the industry now will retire in 40-45 years' time. What will the professional pilot's function be then?

What manual handling skills will they still need?

How many pilots will be required to crew an aircraft?

Will some of these pilots eventually be sitting at a desk controlling a passenger equivalent of the current very effective UAVs (Unmanned Aviation Vehicle)?

Will there be piloted suborbital vehicles?

Will there still be 'Highlands and Islands' flying to remote places only accessible by air but with few facilities for automated flight (i.e. requiring manual handling skills)?

What non fixed wing operations will there be in future (i.e. Helicopters/Dirigibles etc.)?

On the London Underground two lines now operate with a 'driver' who does not normally drive but merely monitors the operation of the doors, the Docklands Light Railway operates with no drivers at all. Will commercial pilots become mere machine minders or high quality commercial managers with real executive authority? (The contrast would be between those powerful Imperial Airways captains and current London Underground drivers).

Training and Competence Standards Tomorrow

Before establishing tomorrow's pilots training and competence standards it will be necessary to answer many of the questions above. This in turn generates yet more questions:

How much Manual Handling training will be required?

If Manual Handling ability is required be part of skills of future pilots how will they maintain competence in this skill when most operations are automated? Can it be practiced in a

simulator or is it essential that it is in an aircraft? Will airlines need to establish fleets of suitable training aircraft for this activity?

Will future pilots be required to maintain the current generally high standards or will the automation of aviation allow for less competent and dedicated pilots?

What sort of personalities will be required and how will Human Factors skills be trained and maintained?

What sort of Computer Skills will be needed? Should future pilots be trained to write computer programmes?

What academic standards will be required or can the present ad hoc systems continue?

What Medical Standards will be required?

What sort of Management skills will be required and if required how will they be taught and monitored?

What sort of career progression will new pilots have? If Highlands and Islands flying continues will new pilots start there before progressing to, perhaps a Desk Driven Passenger carrying UAV type aircraft? Or will there be specific career paths?

Perhaps the most fundamental question under this heading is: 'How much is the airline industry prepared to spend on training when it is desperate to cut all unnecessary costs?

Where will the next pilots be found?

A career in Civil Aviation, even on the flight deck, is no longer regarded as glamorous or indeed well paid. Ambitious school leavers are far more attracted to careers in Finance, the Law, the Media etc. If the best young people are still required how can the Industry still attract them?

Is Aviation still a vocation for enthusiasts or merely another way to earn a living? There were many who entered an Aviation career because of an intense fascination with, even a love of flying and everything about it. It was a lifestyle choice. Is this concept of 'vocation' out of date? (When nurses were generally without degrees and poorly paid, were there fewer complaints about their lack of caring because they too were doing the job as a vocation?).

The cost of 'self-financing' an entry in Civil Aviation can be as much as £100,000. Only the richest of parents could afford this and generally financing is by way of loans. To add insult to injury, due to European regulations, all aviation tuition is liable to VAT, unlike the much publicised and much smaller university tuition fees. There is little opportunity for entry into the profession as the equivalent of an apprentice although some pilots obtain some experience and a little cash by working at flying clubs as instructors.

The Services in many countries are contracting and although there are occasional service redundancies this source of Civil Aviation pilots will never be more than a trickle.

The main question which needs to be asked is: Will the Industry ever be prepared to fully support ab-initio pilot training? Whilst some form of supported training is likely in future it will almost involve 'bonding' (where pilots are contracted to stay with the airline for a number of years paying for their initial training out of their salaries).

How will Civil Aviation keep and develop its Pilots?

Currently there is widespread disillusion on many flight decks brought about by the stress of servicing training loans; degraded Flight Time Limitations (FTLs) leading to ever more onerous working; poor pay at entry levels and very limited pay increases for more senior pilots; contract working and frequent base changes (usually so an airline can cheat on FTL provisions) leading to lifestyle instability; the continual day to day frustrations of demeaning Security checks and a generally poor work and life balance.

The public's demand for ever cheaper flying is leading airlines to seek younger, less experienced and thus cheaper pilots. There are unsubstantiated reports of airlines finding excuses to shed their more experienced and expensive pilots and this approach is aided by the use of contract pilots where only the youngest and cheapest are employed.

This all leads to a very unstable career path towards command mainly based on contract flying interspersed with periods of unemployment. It is possible for pilots to acquire sufficient nominal experience for command without having had any mentoring or in flight training for such promotion. Within ten years this dilution of quality training for command may become apparent in the accident statistics. (This is the topic for the RAeS conference in March).

The Main Questions in Summary

What sort of pilots will the industry require – cheaper, with less skill and training, or expensive 'Right Stuff' (Captain Sullenburger et al)?

How many pilots will be needed?

What will they eventually be flying?

What sort of academic, medical, management and human factors skills will be required?

What sort of Manual Handling abilities will be required and how will these be maintained in an automated environment?

Can Civil Aviation allow automation to support lower cost, lower skilled pilots?

Should there be a Civil Aviation equivalent of the RAF's Central Flying School?

Should entry to Civil Aviation be dependent on initial instruction by an instructor trained at the 'Civil CFS'?

Does the profession of Civil Aviation pilot need basic entry requirements or is the present ad hoc system of airlines setting the standard on supply and demand sufficient?

What will new pilots be taught and how will they be taught?

How will the career progression towards command be arranged in a time of unstable employment?

How much is the Civil Aviation industry prepared to pay to train and employ the right pilots?

The Final Questions

Can 'Cut Price' Civil Aviation continue to support that virtuous safety circle within the Recruitment, Selection, Training and continued employment of its pilots?

If all these questions are not answered properly, will the effect of the dangerous vertical Third Dimension take over again and accident statistics become unacceptable to the travelling public?

The Authors

Ian Frow*: Awarded a Flying Scholarship at school, he was trained as a pilot in the RAF during National Service and on leaving joined BOAC as a 'Cadet Pilot Navigator' at a time when specialist navigators were being phased out. He subsequently qualified as a pilot on Boeing 707s before moving to the Boeing 747, within a year of its introduction into service. He flew the 747 in several of its varieties for the next 30 years. During his career he spent 35 years as a trainer, initially training, checking and examining his fellow 'pilot navigators' and then as a training first officer and training captain in all roles together with Type and Instrument Rating Examining. His final role in a nine year 'retirement job' in Virgin Atlantic was as Flight Technical and Development Manager. Although he has contributed over many years to BALPA mainly in technical activities, (including a detailed technical and operational handling evaluation of Concorde), none of the opinions and questions should be taken as representing BALPA views in any way.*

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