FUTURE AE TRAINING

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This article is an edited version of a presentation at the 1988 Royal Naval Engineer Officers' Conference.

ABSTRACT

The spread of the microchip and the advent of the data bus, resulting in systems sharing components, will necessitate revised trade responsibilities within the Fleet Air Arm, and consequent changes in maintenance training.

The 'gleam in the eye' of the designers and MOD project teams is not too early to be thinking about training. All too often the excitement of the procurement process and the traumas of MOD funding mean that the six years required to realign career training to cover new techniques is not met.

For the Fleet Air Arm, the introduction of new aircraft types over the next decade is going to be as far-reaching in their effects on maintenance and maintenance training as the switch from wood and canvas to metal structure or from reciprocating engines to the jet.

FIG. 1—EH101

The new generation of Lynx and Harrier and, perhaps most importantly, the totally new Merlin (EH101, FIG. 1) will rely heavily upon digital techniques. Even the hitherto unscathed mechanical trade will suffer from the onslaught of the ubiquitous chip in equipment such as digital engine control systems. Not only are equipments becoming similar—most will include a microprocessor—but they will often be communicating with each other on a common data bus system or, in the case of the new radar for the Harrier, Blue Vixen, along a fibre optic cable.

Fortunately most Fleet Air Arm ratings and air engineer officers (AEOs) have become used to working across trade boundaries. Senior maintenance ratings, on small ships flights in particular, gain considerable experience of the other two trades. The term 'systems approach' is not new to the Fleet Air Arm. The aircraft has, for some time, been regarded as a system in its own right. Until now, however, it has been possible to allocate trade responsibilities to particular sub-systems, with the AEO acting as referee in the grey area in between. All AEOs will remember typical discussions in their squadrons between the Chief M and Chief L on the performance of the flight control system and whose fault it was that the aircraft did not fly straight.

What is new is the tremendous broadening of this grey area caused by many of the black boxes talking to one another, blurring once fairly well defined systems. How do you define what constitutes a system when the component parts of one are shared by another system and both systems may be using the common area concurrently? In most cases there is only one sensible answer—the complete aircraft.

The advent of the data bus system, with its tremendous advantages of weight saving and the ability to build in redundancy for increased reliability and flight safety, also brings new problems for those involved in maintenance. The days of fault-finding with the avo are numbered and almost all technicians will find themselves in future working with radio frequencies and chasing pulses of radar-like width.

Fortunately most of the equipment will be self-monitoring with built-in test and data logging. Provided that these systems work effectively this should ease problems, hopefully tracing many faults to at least board level. However there is little point in identifying faults within a piece of equipment to this level if we are constrained by the maintenance policy to return the equipment to the Naval Repair Organization in the U.K. or even to the manufacturer for repair. The delays and the resultant reduction of already scarce black boxes will result in aircraft themselves sitting idle unless we resort to the all-too-familiar programme of undesirable, piecemeal robbery.

Most Lynx radar modifications have been embodied by our own artificers without returning equipment, through the stores department, to outside agencies. The disruption to operations has been minimized and the savings have paid for the cost of each printed circuit board (PCB) repair facility many times over.

The other grey area introduced by this new technology involves the dilemma 'When is a fault not a fault?'. The equipment may be functioning perfectly, but still not doing what was expected of it. A hardware fault is generally going to be identifiable but a software fault can be very difficult to initially identify and, once identified, needs to be remedied by support facilities ashore and retested under strictly controlled simulation conditions. Despite extensive pre 'release to service' testing, the software fault is bound to occur and we must be ready to identify it. In many cases this will depend on being able to state categorically that there is no hardware fault—not an easy task when it is not possible to test the equipment in its working environment, in flight. Representative testing is a problem which we are all likely to encounter, whether we fly, float or sink for a living.

The Air Engineering School (AES), responsible for all aviation mechanical and avionic technical career courses, has gradually evolved a training package for mechanics, artificers and AEOs which, whilst not producing 'super-system men', does permit them to think and work across trade boundaries. The essential elements of aircraft maintenance documentation and safety precautions are common to all trades and great emphasis is placed upon cross-training. A fully fledged systems approach was discussed as far back as 1984, when the new technology was threatening to engulf us. Fortunately the march of progress has been fairly slow, and, until now, has arrived in the form of isolated equipments. Although these employ fairly complex techniques, they have proved manageable by technicians who have received training in digital techniques, now part of all avionic artificer career courses, and suitable equipment training.

We have, therefore, a reasonable base on which to build, in order to meet the challenge of the new aircraft types. Digital courses now include substantial emphasis on fault diagnosis, both at the hardware and software level. Computer literacy is an essential part of any engineering course that is preparing a man to deal with future equipments. Computers are an integral part of most new systems and they can no longer be viewed simply as an engineer's tool such as a calculator, the internal workings of which are immaterial. Understanding computers should be considered as fundamental to technical training, including the degree training at Manadon, as the theory of gas turbines or radar. We ignore it at our peril.

The commonality of equipment techniques is steering us towards further trade rationalization within the Fleet Air Arm, although the exact split of trade responsibilities is a matter for debate within the Sub-Branch. The WL and R divide has been narrowed and must almost certainly disappear in the future. But is this enough? How will we tackle fault finding on digital engine control systems which require knowledge of digital techniques and gas turbine theory? The training of the WL and R Artificers is already common for the first two and a half years, together with the requirement that they become Qualified to Maintain in both trades during their field training.

Despite the disappointing trend towards the policy of repair by contractor, which appeared to be the norm a few years ago, the emphasis on skill of hand, both for the Mechanical, Weapons Electrical and Radio trades remained within the AES. Maintaining these skills has meant that future maintenance policies, which now often and sensibly permit our technicians to repair at component level, can be supported.

One of the key areas in the future for skill of hand is in the PCB repair—and we must cope with the dramatic contraction in size for the new generation of boards. The FAA now leads the field in this technology, in the handling of electrostatic-sensitive device and in surface-mounted device techniques. The young men of today are quite capable, given the correct training, tools and, above all, spare parts, of keeping our equipment on line, without excessive reliance on outside agencies, thereby avoiding the associated delays and frustrations.

In this article there has been much talk of the technician and the engineer but what of the mechanic and his job satisfaction? Are there opportunities for enhancing his status through sensible use of new technology? Within the FAA, it is felt that much more use could be made of mechanic and considerably more responsibility could be placed on him especially at PO and CPO level. The increasing demands on technicians may mean whole areas can become the mechanics' province. Job satisfaction would improve and we would retain the experience so vital in maintaining the front line fleet.

In 1988 at H.M.S. *Daedalus* we hope to commence a comprehensive revalidation of Fleet Air Arm technical Operational Performance Statements, and mechanic job satisfaction will be an important consideration. On the basis of this 'in depth' analysis we should be able to approach the subsequent course design with confidence—confidence that the artificers and mechanics of the future will be able to cope and that the lengths of courses are the minimum achievable.
