AIR ENGINEERING BRANCH DEVELOPMENT AND AE RATING TRAINING

BY

LIEUTENANT-COMMANDER R. RAGER, RN
(*HMS Daedalus*)

ABSRACT

The AE sub-branch is undergoing major review as part of FONA's manpower strategy and changes in AE manpower employment will be introduced from mid 1992. This article describes the background to the changes, the major task analysis study undertaken by the Operational Performance Statement study team, and the Air Engineering School's programme for design and introduction of new career courses for all AE ratings.

Introduction

The last major review of the AE sub-branch and the technical responsibilities of AE ratings occurred during Engineering Branch Development in the late 1970s. That review resulted in rationalization of responsibilities for aircraft weapons and weapons systems with the formation of the WL trade category. Since then the rapid advances in aircraft technology which were discussed in this *Journal* in 1988[1], have produced a need for a more fundamental review of the way in which the sub-branch conducts its business. This need has been recognized since the mid 1980s and a number of small studies examined particular aspects of AE business, as part of the Aircraft Support Project. Most of these studies concluded that it was essential that career-course training of AE artificers and mechanics should be rationalized and, in particular, that the sub-branch should move from the existing M, WL and R trade categories towards a two-trade structure based on mechanical systems and avionics systems.

The need for rationalization was driven by three main factors:

(*a*) The requirement to improve manpower flexibility.

(*b*) The severe mismatch between the maintenance workload in Naval Air squadrons and the numbers of ratings in the three current trade categories.

(*c*) The increasing rate of change of aircraft technology.

Factors external to the Service have also driven the need to change training procedures. Over recent years the philosophy of the Business and Technician Education Council (BTEC) has changed significantly and, as it was MOD(N) policy that artificers should qualify for the National Diploma, methods of AE training had to be brought into line with the BTEC requirement for greater emphasis on student-centred learning and practically-based assessment. The same general approach was also required so that trainees who had come through the GCSE system would more easily be able to assimilate naval engineering training.

The OPS Study

As a consequence of all of these factors, MOD(N) established the Operational Performance Statement Study (the OPS Study) late in 1988 to examine the future requirements of the AE sub-branch. The study team formed up in the Air Engineering School (AES) at HMS *Daedalus* and started work in January 1989. Its remit was:

(*a*) To review current and future AE maintenance requirements and to propose the optimum future trade structure.
(*b*) To redefine the working interface between the artificer and the mechanic.
(*c*) To derive new job descriptions and operational objectives for all rating categories in the structure proposed.

The study team, comprising a lieutenant E(AE) and 12 senior AE artificers, was attached to the AES Training Design Group (TDG). The study had to be completed and the final report submitted by January 1990. An initial requirement for the study to include consideration of merging responsibility for aircraft Survival Equipment (SE) into the AE task was later rescinded as the Aircraft Handler branch, of which the SE category was a part, was to be studied separately. The OPS team did, however, produce operational objectives for SE ratings.

Throughout the study the team was guided by a steering committee consisting of representatives from MOD(N) and FONA staffs and the Air Engineering School. The committee were kept abreast of the team's work and likely proposals during the year-long study and consequently were able to validate and approve the final conclusions and recommendations before the study report was forwarded by the AES for formal approval. The Air Engineering Advisory Panel were also briefed regularly and they too endorsed the proposed way ahead. FONA staff conducted a full investment appraisal of the structural changes proposed and their manpower implications, and forwarded a manpower strategy package with the study report in July 1990 for MOD(N) approval. The approval process was delayed by Options for Change and Operation Granby, but Second Sea Lord's approval for the full package of proposals was received in January 1991.

Study Methodology

The OPS study was conducted in the following phases:

(*a*) Task analysis of a representative population of AE ratings by means of a questionnaire.
(*b*) Analysis of responses to the questionnaire.
(*c*) Assessment of new technology and the associated maintenance policies.
(*d*) Development of supervision and authorization requirements.
(*e*) Development of the optimum trade structure.
(*f*) Production of new job descriptions and operational objectives.

Task Analysis Questionnaire

The team sought assistance from the RN School of Educational and Training Technology (RNSETT) and the Army School of Training Support in devising the task analysis questionnaire which contained 330 questions each with four areas of response—frequency of task, perceived difficulty of tasks, time spent on tasks, and work carried out by ratings outside their own trade category. It also contained a number of open questions on the following topics to which personnel were invited to respond;

(*a*) Aircraft work which could be carried out without supervision.
(*b*) 'Artificer' tasks which could be undertaken by mechanics.
(*c*) The optimum trade structure.

The task analysis population sample consisted of 1040 AE ratings (26% of the trained strength) including 297 artificers and 743 mechanics, and also 32 SE ratings (20% of the trained strength). This sample size was sufficient to produce

statistically valid results from analysis of the questionnaire responses. Personnel selected served in first and second line billets in all four Air Stations, front line squadrons, the Clockwork detachment in Norway, and the Air Engineering Departments in HMS *Ark Royal* and RFA *Fort Grange*.

Analysis of Questionnaire Responses

All responses to the questionnaire were analysed by the Army's Computerized Occupational Data Analysis Programme (CODAP) at Worthy Down. The analysis produced very detailed information on the maintenance tasks currently performed by AE ratings, including the following points:

(*a*) Approximately 40% of senior and junior rating mechanics of all trades were involved with skill-of-hand repair tasks.

(*b*) 25% of M trade ratings disconnected and reconnected electrical equipments.

(*c*) 50% of the responders assisted with work in other trade categories.

(*d*) 35% of the R trade ratings assisted with weapons-related work.

(*e*) Approximately 31% of responders believed that current levels of supervision could be reduced.

(*f*) 42% of the artificers and 50% of the mechanics believed that there was considerable scope for extending the range of aircraft work given to mechanics, including skill-of-hand tasks involving the use of cutting tools.

(*g*) Some degree of a merger of WL and R trade responsibilities was generally supported.

AE managers from commander level down to CCAEA were also invited to comment on the future requirements of the sub-branch. Nearly two thirds of those questioned were in favour of giving mechanics more responsibility for aircraft maintenance tasks with the exception of complex system fault diagnosis, the complex aircraft repairs and flight SMR duties. There was general agreement that broader authorizations should be awarded to mechanics at all levels, and that there should be a reduction in the number of artificers, with a corresponding increase in mechanics.

Impact of New Technology

In assessing the impact of new technology, the team looked at the increasing application of automatic test equipments—Automatic Test Equipment (ATE), Built In Test Equipment (BITE) and General Purpose Automatic Test Equipment (GPATE). It was anticipated that, assuming good software integrity, these equipments would be operated by mechanics rather than artificers, and in mechanical systems the introduction of Health and Usage Monitoring (HUM) would improve aircraft maintainability.

The team concluded that there remained a need for artificers with deep skills at all lines of servicing, particularly when employed remote from second line support, in situations where test equipment failed or was suspect, where greater skills or expertise were required, in emergencies when improvisation was needed, and during introduction of new systems into service.

Future Trade Structure

From all data received the study team established a number of options for the future trade structure. Each option was compared with the existing structure and all other options in relation to:

(*a*) The basic structure and its impact on personnel.

(*b*) Authorizations and supervision requirements.

(*c*) Responsibilities for weapons and weapons systems.
(*d*) Skill levels.
(*e*) Training requirements.

The team applied weighting factors to the advantages and disadvantages to produce a decision matrix to help identify the best option, and from this a number of conclusions and recommendations were derived. The main recommendations of the final study report were:

(*a*) Mechanical trade ratings should be trained and authorized to use BITE and to carry out limited electrical work at first and second lines, including diagnosis of digital engine controls and flying controls system faults and removal and replacement of associated Line Replacement Units (LRUs).
(*b*) The WL and R trade categories should have a common core of training in, and shared responsibility for, avionics systems which overlap existing trade boundaries, including integrated weapons systems.
(*c*) Air Engineering Mechanics (AEMs) should be trained and authorized to work across all trade boundaries at first and second line levels, carrying out all flight servicing, specified routine servicing and minor repair by replacement, and husbandry rectification all without supervision. AEMs should be trade categorized at the Leading Rate Qualifying Course level dependent on proven ability, field recommendations and the Service needs. At the senior rating level all mechanics would be given a short course covering management skills and aircraft administration.
(*d*) Authorization and supervision requirements should be rationalized at all levels. Mechanics should receive the same degree of authorization as artificers at equivalent rates except that they should not be authorized as ships' flight SMRs. The LAEM should be awarded a supervisory certificate of competency on completion of the LRQC and a local board.
(*e*) WL and R trade mechanics should be responsible for custody, preparation, supply and administration of air weapons ashore and afloat. Ratings of all AE categories should be trained to load weapons, and senior WL and R artificers and mechanics should be authorized to supervise weapon loading.
(*f*) Career course training should be systems-based and, for artificers, should cover fault diagnosis on complex integrated systems. Consolidation and on-job training should be properly structured, controlled and validated. All career courses should include, at an appropriate level, keyboard skills and computer literacy, skill-of-hand, fault diagnosis and basic management techniques.

These changes will greatly improve manpower flexibility and increase job satisfaction for both artificers and mechanics. They will allow more cost-effective employment of the highly trained artificers by releasing them from routine maintenance tasks, leading to financial savings through de-enrichment of schemes of complement. Additionally the proposals provide a sound basis for further evolutionary change of the sub-branch as technology continues to advance in future years.

Clearly the proposals have many fundamental implications for the AE sub-branch, including the need to revise maintenance regulations and maintenance schedules, advancement regulations and schemes of complement. All implementation problems including, *inter alia*, a need for new rating and trade category titles and new trade badges, will be managed by FONA's AE Branch Implementation Group (AEBRIG) in conjunction with the AE Training Policy Advisory Group and the Structure Policy Advisory Group as appropriate.

Training

For the AES the current task is to design and implement new career courses, to procure a range of modern purpose-built training equipments to meet the requirement for systems-based training (see FIG. 1), and to plan and implement the changeover from existing career courses. Since the OPS study was completed TDG staff have been working on new course design starting from the job scalars and operational objectives produced by the study team.

FIG. 1—THE GENERIC AIRBORNE RADAR TRAINER—A PURPOSE-BUILT AIRBORNE RADAR SYSTEMS MAINTENANCE TRAINER IN USE IN THE AIR ENGINEERING SCHOOL AT HMS 'DAEDALUS'

Work on the AEM's Basic Qualifying Course (BQC) and the pre-field Artificer Apprentice Course (AAC) is progressing well and the new courses will be introduced in May 1992. Both courses will be approximately 20 weeks long and will be similar in content. AEMs and AAs will leave these courses with broad-based knowledge across all aircraft engineering disciplines at the depth required for them to operate successfully at first and second line levels in the squadrons and Air Engineering Departments once they have completed their On Job Training (OJT) and have qualified as Qualified to Maintain aircraft and Qualified to Sign. The first newly trained ratings will leave *Daedalus* in the autumn term of 1992 and should complete OJT in the spring term of 1993.

Initial development work for the Artificer Qualifying Courses (AQCs) and the Leading Rate Qualifying Courses (LRQCs) is progressing, with a target date for introduction of the new courses in September 1993. It is planned that the short senior rating mechanics' course will also start on the same date. Design of all courses follows the approved design process of development from job scalars and operational objectives through a training analysis to produce training objectives for the AES and OJT phases and then instructional

specifications and assessment criteria. Where appropriate, BTEC standard units will be incorporated in the AQCs.

Conclusion

The total project from commencement of the OPS study to introduction of new career courses for all AE ratings is bigger and more far-reaching for the sub-branch than the Engineering Branch Development and Slimtrain changes together, and it will shape the training and employment of AE ratings until well into the next century, equipping them to deal with the new technologies in updated versions of current aircraft and in the Merlin. A programme of introduction of new procedures and new regulations into individual squadrons and Air Engineering Departments will commence in 1992 and is likely to take at least 18 months. Existing career courses will be phased out as classes already under training complete their courses. The last artificers to be trained under the present system will leave the AES in 1995, and the first artificers to complete post-OPS career courses will join the fleet early in 1996 shortly before the Merlin is programmed to enter service.

Clearly it will be some years before all effects of the full package of changes work through the system, and some ratings already in the fleet will be unaffected by the changes. In the long term the more rational trade structure, delegation of responsibility to the lowest practicable levels, the advent of the all-trade AEM and the general broadening of individuals' capabilities will lead to much improved flexibility of employment, reduced stretch, improved aircraft availability and thus improved operational effectiveness.

Reference

1. Dore, R. T.: Future AE training: *Journal of Naval Engineering,* vol. 31, no. 2, Dec. 1988, pp. 461–464.