A Progress Report on the Introduction of A.D.P. for Recording Contributions Paid under the new Graduated Pensions Scheme

By D. W. Polley

The United Kingdom Government Graduated Pensions Scheme for all employed contributors is due to come into operation in April 1961. This paper, which was presented at the Harrogate Conference of The British Computer Society on 7 July 1960, gives a report on the progress which has been made in organizing the new records to be kept on an Emidec 2400 computer.

Introduction

The need to obtain an A.D.P. system for the Ministry of Pensions and National Insurance (incidentally we have a LEO II installed already for payroll and statistics work) came from new legislation in 1959 introducing what we call the *Graduated Pensions Scheme*. There has been, for some considerable time, a National Insurance scheme whereby employed, self-employed, and non-employed people pay a fixed contribution each week to provide, amongst other things, a retirement pension at the appropriate age. The record keeping for this system is done clerically. The new Act introduced a scheme whereby employed persons would pay contributions directly related to their earnings, and would receive in return a pension with the same relationship. The new scheme is *complementary* to the old, flat-rate scheme, which will continue to operate.

Putting it very simply, the requirements of the new Act are that employees and employers shall each pay a contribution equivalent to $4\frac{1}{4}\%$ of all employee earnings falling between £9 and £15 in an Income Tax week, or on the equivalent range for those paid at longer intervals —for example, the monthly-paid range is £39–£65 in any Income Tax month.

The contributions paid will be collected by the Inland Revenue Department along with P.A.Y.E. Thus, for the majority of contributors, the normal vehicle for notifying contributions paid will be the Standard Tax Deduction Card (the P.9) which from April 1961 will have an extra column for National Insurance purposes. Some large concerns, especially those with a payroll on A.D.P., will have specially agreed schemes using non-standard forms.

The purpose of the new A.D.P. system, to be installed at Newcastle, can be summarized as being to record contribution data in respect of contributors to the Graduated Scheme, and to supply such data to the parts of the Ministry's organization responsible for determination of claims.

Why A.D.P.?

When we were first asked to examine the requirements for recording graduated contributions it was obvious that there were three ways, and probably more, of tackling the work:

(*a*) To use a clerical system.
(*b*) To use punched-card accounting machines.
(*c*) To use a computer-based A.D.P. system.

Examination of the three methods showed that a clerical system would require far too many staff and too much accommodation to make it a "runner."

There was, however, some doubt as to which of the remaining methods should be used. The final decision to use A.D.P. was taken after consideration of the two methods under the following heads:

Cost	On an annual basis A.D.P. was cheaper.
Flexibility	A.D.P. seemed to be more adapted to cope with modifications of requirements. Spare time for additional processing could be provided by extra shift-working. Non-standard data could be recorded more easily than on punched cards.
Accommodation	A.D.P. required half the accommodation needed for a punched-card system.
Reliability	It was felt that there were risks with both methods.
Manageability	A punched-card system would pose problems of management, arising from the sheer bulk of material to be handled. In the system some 80 million punched cards would be filed each year. Cards would be pulled and refiled constantly.
Accuracy	It was felt that, because of the amount of human intervention, a punched-card system would be more liable to error.

Other items considered were:

Processes of setting-up.
Technical know-how available.
Timing of machine deliveries.
Interchangeability of machines and data.
Maintenance.

The approach to systems work has been to look upon the whole job as divisible into two obvious major

activities, and the implementation teams have been divided in this way:

(1) Data preparation (5 Systems analysts)
(2) Computer processing (16 Systems analysts)

All systems men have been recruited from executive staff within the Ministry, and only one had previous A.D.P. experience although some had considerable experience of the control of punched-card installations.

Data Preparation

It is true to say that Data Preparation used to be the Cinderella of an A.D.P. system. With us it has never had a chance to be so, as we knew from the outset that the operation was fraught with difficulties. We will receive 30 million tax deduction documents each year, during the period April to August. It would not be easy to organize the punching of machine cards for these input documents if we had a complete 12 months in which to do it. The difficulties, however, are emphasized by the fact that not only do we wish to get the data on to our main records as quickly as possible, but the Inland Revenue Department require the tax deduction cards to be returned to their Inspectors' offices quickly. A further complication is that the receipt of the 30 million cards will not be spread evenly over the period April to August. It is anticipated that the lowest weekly receipts will be some 68,000 and the highest over 2 million. In fact the bulk of receipts will be during a 10-week period.

This, then, identifies the first problem we met. It is obviously impracticable to staff an installation on the basis of clearing the daily intake when there is a peak during 10 weeks out of 52. It would be almost impossible to retain staff during the off-peak period, due to boredom—it would also be a waste of manpower and money.

As it is essential to hold some evidence of what data was notified to us (dealing with 30 million documents, there are certain to be queries about whether we have posted the correct amount), and as we must release the original tax deduction card to Inland Revenue we propose to give serial numbers to all tax deduction cards, and to microfilm them for archival purposes. Although we will punch as many cases as possible from live documents, any overflow (and we think there will be between 6 and 8 million) will be punched either from microfilm display or from a copy taken from microfilm. No more details of this can be given at present, as this part of the investigation is still proceeding.

The procedure in the data-preparation section will be as follows:

(*a*) Receive tax deduction cards in employer batches.
(*b*) Serially number and microfilm —— process microfilm.
(*c*) Punch control card for each employer batch, showing data such as employer identity, number of cards in the batch, total value of contributions to be posted, serial number of first card in the batch.
(*d*) Punch data from tax deduction cards (we will punch 4 cases to each 80-column card; the microfilm reference number will be allocated automatically by a later computer process).
(*e*) Verify numerical data.
(*f*) Pass punched cards to Computer Group for reconciliation and posting.
(*g*) Enter routine for "overflow" action (unpunched tax deduction cards).
(*h*) Return tax deduction cards when (*f*) and (*g*) cleared.

A punching organization of 100 punches and 40 verifiers will be used for this work.

Computer Processing

The equipment to be used for the main processing work is the Emidec 2400—the second to be ordered by Government service, the first being for the Royal Army Ordnance Corps—comprising:

1 Computing unit, including 64-word diode-capacitor store, 8,192 word magnetic-core store, 4 input/output buffers.
2 Search units (off-line).
1 Control desk.
1 Switching unit.
19 1-in. magnetic-tape units.
1 Punched card to magnetic tape converter (off-line).
1 Xeronic printer (off-line).
2 Ferranti paper-tape readers, with Creed reperforators, associated equipment, and spares, together with spare units, components, maintenance equipment, etc.

The card to tape converter will be delivered in February 1961 and the main equipment by August 1961. The installation should be capable of being fully operational by December of that year.

The first tax deduction cards will be received in April 1962, and posting of records to the master file must commence soon after the first cards are received. You will have appreciated already that we have considerable setting-up work to do, in preparing the basic files and program testing. Some of this we hope to do on the prototype machine on the manufacturer's premises, and punching of cards for master-file work has already commenced—incidentally there will be some 34 million cards involved, relating to a population of $28\frac{1}{2}$ million. At present we have punched about 500,000 cards.

I mentioned earlier the broad functions of the Graduated Pensions-Scheme Records A.D.P. Installation—obviously there are a number of things to do to achieve the broad objectives. In more detail then the procedures and the computer system must:

(*a*) Establish that all graduated contributions are posted (this will be done by reconciling totals of individual items with control totals).
(*b*) Post graduated contributions to the correct individual account.

(*c*) Retain a copy of all posting documents received.
(*d*) Identify cases of excess payments (to make a refund possible).
(*e*) Identify erroneous payments, e.g. where a person is not of the appropriate age.
(*f*) Issue an annual statement to all contributors and in certain circumstances to people on the master file who have not contributed.
(*g*) Issue an invitation to persons approaching minimum retirement age or deemed retirement age to claim a pension.
(*h*) Furnish authorized branches of the Ministry with details of the recorded graduated contributions.
(*i*) Provide some housekeeping and internal processes.

The Basic Records

For the 28½ million people forming the population for Graduated Pensions purposes, we will maintain three main files:

(1) A Name and Address File—which will be used once a year in preparing statements and invitations to claim a pension.
(2) A Cumulative File—sufficient to answer normal inquiries.
(3) A History File.

Name and Address File

The name and address file will contain the last known address of each person. As this data is really required only once a year it is pointless to process it daily. It will be brought up to date each year by incorporating the 3¼ million change of address notifications we expect to receive. Each record on the file will contain about 65 to 70 characters of information, and the whole file will occupy about 500 reels of magnetic tape.

Cumulative File

This is the file on which we record sufficient data to enable us to answer inquiries. I suppose we call this our Main Processing File, and it will be updated—by posting tax deduction card data—on a two-week cycle.

Each record will have 25 characters of identity and basic information:

National Insurance number
3 letters of surname
2 initials
} the identity data
Sex
Date of birth
Cumulative total of contribution units at the start of the current year.
An indicator (status).

To each record will be added 18 characters of information for each tax deduction card posted to the record. The average will be 1½ tax deduction cards per case—some will have one, others may have ten or so. A new Cumulative Contributions file will be created each year. The file will be contained on 150 reels of tape, expanding to 300 at the end of the year.

History File

The History file will contain the year-by-year contribution record for each insured person. In size the file will be about the same as the Cumulative Contributions file, occupying about 300 reels of tape.

All the record tapes will be duplicated for safe keeping.

Daily Processing Runs

In the section on Data Preparation, above, I mentioned that tax deduction cards would be returned to the Collector's office only when amounts had been reconciled. Thus, after cards have been converted to magnetic tape on the card to tape converter, the tapes will be edited. Constant or identifying data—such as employer name and document serial number—will be inserted into each record automatically, and the employer scheme will be reconciled to check that totals of contributions represented by each deduction card agree with the check total shown for the full scheme.

Schemes which do not reconcile will be punched on to output cards; these will be interpreted, and clerically checked against the archival microfilm record, and the error or errors identified and corrected.

This process will produce a *Daily Alterations Tape* which will be sorted to the order of records on the main file—that is, National Insurance number order.

The Cumulative Contributions file will be processed on a two-week cycle to update the records by the addition of contribution data. In fact one-tenth of the record will be updated each day by running it with the Daily Alterations file as yet unposted.

These are some of the actions that will be carried out during this run:

(1) Contributions data will be inserted.
(2) Excess payments will be identified.
(3) Cases calling for the issue of a supplementary statement of account (because of late notification) will be identified.
(4) Statistical sample cases will be identified.
(5) Unmatched items will be punched on to output cards.

Each day we expect to receive some 2,000 inquiries requiring reference to the Cumulative Contributions file to supply the required data. It is also necessary to identify automatically records relating to persons who should be invited to claim a pension. To achieve this we will prepare a call tape showing the identity of the cases involved and, using the two search units, extract copies of the appropriate records from the Cumulative Contributions file. We will process the Contributions file on a two-day cycle, each search unit taking one-quarter of the file per day.

The output will be a selected data tape which will be processed with the original inquiry on-line to produce a tape for off-line printing on the Xeronic printer.

Annual Processing

There are certain jobs which fall due only once a year.

Between November and February the Cumulative Contributions file and the now updated Name and Address file will be processed together to produce a tape containing data for printing contribution statements. The statements (20 million) will be printed off-line on the Xeronic printer.

In March each year the Cumulative Contributions file and the History file will be processed to produce the Starting Contributions file for next year, and an updated History file. At the same time, printing tapes will be prepared for printing history schedules.

We decided against referring to the magnetic-tape History file to answer inquiries relating to back periods, simply because of the time factor involved. Initially we expected to store the printed schedules, but soon discovered that this would involve too much paper to store: someone has said 45 miles of it; this may or may not be true. The only way out of this fantastic storage problem is to microfilm the schedules as they are being printed, and a flow camera to attach to the printer is being developed for this purpose.

Conclusion

This, then, is the story of the way we plan to run this new work of Graduated Contributions Records. Much of it is still theoretical, and no doubt there will be changes of approach between now and April 1962.

I think we can claim that this application is the largest data-processing job yet tackled in the United Kingdom. Like all A.D.P. applications, it will be launched mainly because of the enthusiasm, and indeed devotion, of the implementation team now sweating it out at Newcastle.

We have, I believe, another claim to make. So far as I can see, this is the first time a completely new job has been put on A.D.P.; there is no existing procedure to fall back on if we are late with commissioning.

I think it is also true to say that this is the first time that the date of an A.D.P. installation has been fixed by Regulation laid before Parliament!

Problems of the Introduction of Large Scale Data Processing into the Royal Army Pay Corps

By L. D. Slater

This paper surveys the preparatory work on the transfer of the British Army Pay records to an IBM 705 computer system. It was presented at the Harrogate Conference of The British Computer Society on 7 July 1960, some three months before the main equipment is due to be delivered to the Royal Army Pay Corps from the manufacturers.

Introduction

At the beginning of a survey of the problems of the introduction of large scale data processing for a specific application, it is probably essential to define:

(*a*) the specific application to which the problems are related,
(*b*) the equipment to be used,
(*c*) the degree of experience on which comments are based,

and to spend some time on explaining the envisaged processing flow.

The Application

The application is that of maintaining pay accounts for soldiers of the British Army. This task is at present performed partially manually and partially on simple accounting machines. The application is PAY, but it is not PAYROLL. The requirements of the system are as follows:

(*a*) That individual soldiers' entitlements can be assessed on an as-required basis.
(*b*) That the drawings of individuals can be brought to account against entitlement. This is an arrears operation and it should be mentioned that there is no requirement for an individual to draw his entitlement in full.
(*c*) A running account and periodic statement of account shall be maintained and produced for each soldier. This is to be done monthly.
(*d*) Payments to dependants shall be made and brought to account where entitlement exists or where otherwise authorized. The bulk of such payments are, as a matter of interest, of a recurring nature.
(*e*) Certain analyses of issues can be produced for purposes connected with the Army Appropriation Account.

In addition, there is an overall requirement that any system adopted should be sufficiently flexible to be able to cope with rapid expansion in the event of an emergency.

The ultimate number of accounts to be absorbed into the system is dependent upon many considerations. The immediate target is, however, to create a master file of