AN INVESTIGATION INTO MANUAL LABOUR REPORTING WITHIN SOUTH AFRICAN AIRWAYS TECHNICAL

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EXECUTIVE SUMMARY

This study is concerned with an investigation into the manual labour reporting system as currently operated by South African Airways (SAA) Technical.
This was necessary, as a large percentage of the time sheet hours were not being captured with the net result being that costs and the resultant effects were becoming distorted.
The primary purposes of this research was to identify the reasons for the current difficulties being experienced with labour cost recovery within SAA Technical in order to propose changes to rectify the impasse.

The following reasons for the labour hour losses were identified:

- Ineffective operational control methods.
- Deployment of geographically dispersed data capturers.
- Computer programming errors in the transfer routines.

These problems naturally lead to a loss of control.

The following improvements after rectification were noticeable:

- In January 1997, average labour hour under recovery was as high as 46%. After rectification, losses were down to 15% (cf. 4.3).
- The management accounting reporting document was greatly revised; thus rendering improved service to and understanding by the users.
- The automated labour reporting bar scanning system currently being implemented would also benefit from the rectified computer transfer program.

It may thus be concluded that the research was beneficial to SAA Technical operation and provided solid reasons for the labour hour losses.
If the recommendations as presented further on in this study are adhered to, there should be no reason for the present situation not to maintain or improve the current improvements.

ACKNOWLEDGEMENTS

I would like to thank all the people within and out of SAA Technical who assisted, advised and inspired me to complete this study. Without their help, this project would not have been possible. A special word of thanks to my study leader, Dr RWE Van Der Wal who, with his specialised knowledge and ability, guided and motivated me in compiling this document. Once again, thank you all.

TABLE OF CONTENTS

List Of Figures

List Of Tables

CHAPTER ONE
INTRODUCTION TO THE RESEARCH TOPIC

1.1 BACKGROUND TO THE PROBLEM

Knowing what the productivity, the cost and the efficiency of a labour force within a business is, is fundamentally important to an operation for it's continued survival.

This study, which is concerned with an investigation into the manual labour reporting system currently being deployed within South African Airways (SAA) Technical and, more importantly being undertaken to determine the reasons as to why the labour reporting aspect of the operation is currently performing so poorly, is primarily intended to rectify the problems that currently exist.

Labour reporting within SAA Technical, whether it be manually achieved via a time sheet or as is currently being implemented, via a bar coding method, is a component used for management accounting purposes, financial accounting means and, ultimately, as an input in the compilation of SAA's income statement. For these reasons, labour reporting should be regarded as being of utmost importance and, if considered important enough to the running of a business, then the systems and methods used in attaining these ends must be as accurate and precise as possible.

The problem that exists within SAA Technical is that a large percentage of the direct labour hours are not being accounted for, with the end result being that facts and figures become distorted. In January of this year alone (1997) the figure for missing labour hours was as high as 46 percent (SAA Memis: LBR001 Man-hour distribution summary by workshop report, January 1997)

Amongst the benefits that may be derived from precise labour reporting are: improved manpower planning, work scheduling, budget preparation, derivation of third party quotes and, in the long term, sustained profitability - all which underline the importance of this aspect to the running and managing of a business. Without effective mechanisms in place to ensure accurate labour reporting none of the above mentioned activities can be meaningfully attained.

The researcher was introduced to the problem via the SAA technical finance department. This department, which was aware of the under recoveries via reports and feed back, (Memis LBR001 reports, SAP monthly reports) had not been able to accurately determine the reasons for the problems and were of the opinion that the losses were largely attributable to a lack of supervision and to technicians not accounting for the work accomplished (Memis & SAP reports). These perceptions, lack of evidence to substantiate the claims and continual poor performance provided sufficient reason for investigation, which is being undertaken.

The first step in the project was to gain an understanding of the systems, methods and computer systems used in the controlling of labour reporting. Once this step was completed, preliminary investigation into the simulator section within SAA technical was undertaken.

Results from the initial investigation revealed an under recovery of 25 percent which could be attributed to the following reasons:

- Six supervisory staff assigned time sheet status
- Two technicians on a training course and not accounting for their absence
- One technician who forgot to complete time sheets

The hours of the remaining thirteen technicians appeared to have been accounted for accurately (SAA Memis: LBR001 Man-hour distribution summary by workshop, June 1997).

Findings from this preliminary research provided pointers and indicated areas requiring further investigation. A questionnaire was then compiled to identify whether similar reasons as indicated above existed in other departments (cf. 3.2.1). On completion of the compilation

of the questionnaire, which was achieved with the assistance of the manager and superintendent of the simulator section and personnel involved with the Memis computer system and it's programming, the researcher was in a position to define the problem statement more clearly.

1.2 PROBLEM STATEMENT

'Labour hour recovery is poor within SAA Technical and is a contributing factor towards reduced profitability, product pricing and organisational control'.

These under recovery problems within SAA Technical, have existed since the inception of labour recording systems and approximately eight years ago in an initial attempt to eliminate the under recovery and operational control problems being experienced, a system called "short interval control" was implemented.

Short interval control was a product and concept sold to the SAA by a company called Byrne Fleming who's intent it was to resolve the reporting problems then being experienced (Byrne Fleming Supervisory Training, 822D/0557B). To achieve this objective the technicians were required to account for work on an hourly (as opposed to daily basis). However, as subsequently became evident the consultants had not fully understood or investigated the intricacies, idiosyncrasies and nuances of the technical operation and for these reasons the system was not successful.

Determining the reasons for the dissatisfaction/failure were never properly addressed with the net result being that short interval control all but disappeared and actual recorded hours on the job were once again being left to the discretion of the technician performing the work. This discretionary behaviour leads to questionable accountability and, may not always be a true reflection of the hours worked. Current estimates from various superintendents put the accuracy at between 50% and 60% (Larkan, 1997) (Kleingunther, 1997).

In attempts to improve the situation of labour reporting and level of accuracy Management introduced a bar scanning system recording hours on the job per technician (cf. 2.7.3). This project which was recently endorsed and in which trial testing and phased implementation has already begun, should realistically take a further 12 to 18 months to complete (cf. 2.7.3).

Initial reports from the bar scanning system indicate that although this method of recording labour hours will improve the situation, unknown anomalies could still exist. If these influential problems could be identified, then the research would also be beneficial to the improvement of the bar coding process.

It should be noted that the implementation of bar scanning should not negate the research into the manual recording system as some areas are not suitable for this type of method e.g. the Simulator Section - because of the nature of the work and civil operations - because they essentially do not form part of the aircraft group. For these reasons these sections will continue to operate under the manual capturing and recording system.

1.2.1 Physical Location of the Problem

The geographical area that the investigation will concentrate on is at Johannesburg International Airport, Technical section of SAA. The reason for the investigation concentrating within Technical is that it is a profit centre within SAA identified as having a problem with labour reporting and therefore in need of attention (Clarke, 1997). The other profit centres within SAA but not being investigated are:
Cargo, Flight Operations, Commercial and Data Processing.

1.3 RESEARCH OBJECTIVES

The primary objective of this research then is to:

- identify the reasons for the current difficulties being experienced in SAA Technical in order to propose changes to rectify the currently experienced under recoveries.

The secondary objectives are:

- to determine whether there is adequate supervision on the shop floor
- to determine whether there is consistency within the departments in SAA Technical in applying administrative rules, controls and checks in ensuring time sheet control
- to determine whether geographically dispersed data capturing is problematic
- to ensure that the data capturers are entering the information on a daily basis
- to ensure that the data capturers are not overloaded
- to obtain other people's ideas and input with regard to the problems
- to use the superintendents to identify inappropriate staff assignments

1.4 CONSTRUCTS AND CONCEPTS OF THE PROBLEM

The construct of under recovery is one that must be eradicated if the continued success of the operation is to be guaranteed. Under recovery in the context of this investigation means budgeted versus actual i.e. if there are two technicians in a section working 8 hours per day, then at the end of the day 16 hours should be accounted for (cf. 2.7.1). If a technician cannot account for 8 hours work per day on a regular basis then this would indicate an under recovery which may point to an over staffing situation. Likewise, if there is an over recovery, which would be indicated by excessive overtime being worked, then the situation could reflect a manpower shortage.

The concepts supporting the construct of under recovery are numerous including:

- possible computer communication and data transfer incompatibility (cf. 2.9)

- possible data capture inconsistency at point of entry into the computer (cf. 2.9)
- level of commitment of the workers to ensure that the correct information is being recorded
- lack of supervision

1.5 CONSTRAINTS/LIMITATIONS

- Initially it may appear as if the research is redundant, as SAA Technical is progressing towards a bar scanning system which is to replace the manual system. However, discussion of the research validity with various people employed in the computer system design and capture department indicated otherwise. The reasons provided are that similar problems may manifest themselves in the bar scanning system which may possibly be resolved with the research findings from this investigation and for this reason it should proceed (Zahn, 1997)
- a margin of under recovery of greater than 20% in the context of this investigation is assumed to be an indication of a problematic situation. This may not always be true for all departments.
- omissions of greater than 20% may be acceptable in some sections.
- due to the sensitivity of the business, financial figures cannot be quoted and for this reason only hours will be presented.
- one of the problems being experienced is to accurately determine the percentage of under recovery in all departments. This difficulty is due to a cut off date being implemented by one of the computer systems and not the other. The net result is that hours may continue to be entered after month end which could cloud the issue. (This is explained more comprehensively in Chapter 3).

1.6 METHODOLOGY

Two documents will be used in the research, these are a questionnaire (cf. 3.2.1), which will be completed by the superintendents and the other, a time sheet analysis of a 20 percent random employee sample to be completed by the data capturer in the section concerned (Addendum 2).

The results from the individual sections will be quantified, correlated and compared to each other and from this information, recommendations and proposals will be presented.

The pilot study of the Simulator Section (cost centre 8015), was decided upon as it is a section which is small, with 20 technicians, yet conforms to the rules and regulations as applied within Technical (SAA Memis: LBR001 Man-hour distribution summary by workshop, June 1997).

The findings from Simulators as mentioned will also be used as input to guide the research and compilation for relevant questions for the survey, and only once a firm understanding of the problems within this section have been identified and questions of an applicable nature compiled, will the research be transferred into the other areas within Technical itself.

Obtaining an understanding of this interaction will provide the researcher with the necessary background and understanding to ensure that meaningful statistics, inferences and answers can be provided.

1.7 TYPE OF RESEARCH

The research, which will be of an empirical and quantitative nature, will be used to provide improved systems and methods within Technical. Reports on the findings, (as per Addendum 1) once results are achieved, will be circulated to all sections concerned .

1.8 DATA COLLECTION

The data will be derived from the Memis LBR001 report, SAP monthly reports, the questionnaire and results/findings of the 20% sample of time sheets.

1.8.1 Population

There are a total of 382 cost centres within SAA Technical, of which 70 are directly related to labour hours capture and reporting. The remaining 312 cost centres report on items such as fixed cost recovery, overhead allocation, machine hours, engineering man days, oven cycles large/small, etc. and therefor do not qualify for further research.
(SAA Technical cost centre activity table, 1997)

1.8.2 Sample

All 70 cost centres reporting on labour hours will form the main focus of the investigation and will be thoroughly researched to determine the severity and location of the loss of man hours (SAA Memis: LBR001 Man-hour distribution summary by workshop, June 1997). To gain an insight into the man hour loss problem, each superintendent or manager of cost centre/s under their control will be required to complete the survey questionnaire and, additionally, the data capturer entering that

superintendent/manager's section's information will also receive a form which will require further investigation by that person concerned (cf. 3.2.1) (Addendum 2).

The sample for the data capturers will be 20% of that specific cost centre's time sheet staff's complement is intended to determine whether there are loop holes in the integrity of the current system which controls the recording of an individual's submission of time sheets in the specific section (Addendum 2). It will also be used as an indication of what is reflected by the Memis computer system and what was claimed to have been entered by the data capturer (SAA Memis: LBR001 Man-hour distribution summary by workshop, June 1997).

1.8.3 Methods and Techniques used to collect data

The domain under investigation will be all the cost centres within SAA Technical reporting on labour hours.

June 1997 was decided upon as being the month in which the research and investigation would occur with the survey/questionnaire forms being personally distributed to all superintendents/managers at the beginning of July 1997.

The superintendents/managers will then be required to complete the questionnaire/survey applicable to June and obtain the 20% technician sample information from their respective data capturers (cf. 3.2.1) (Addendum 2).

The only difference to this method applies to the aircraft group (an explanation of the aircraft group appears in the following chapters) as preliminary investigation indicated that this was a particularly problematic area with regard to retention of archive material (figure 4.4).

This method will involve delivering the 20% technician Time sheet samples at the beginning of June to the data capturers as opposed to the beginning of July and requesting them to fill in the information as and when the time sheets arrived for the month of June. This approach was necessary as the large volume of time sheets being dealt with was impossible to archive and were being destroyed or discarded immediately after capturing.

1.9 DATA ANALYSIS

The data derived from the preliminary research and survey results will be used to provide the reasons for the missing labour hours. These empirically derived statistically based results will be attained through the use of comparative and differential analysis, with the subsequent recommendations and results being used for management purposes.

1.10 OUTLINE OF EACH CHAPTER

In Chapter Two, an overview of the literature, including both the macro and micro environment pertaining to the subject is discussed, while in Chapter Three, the research design which is empirically based is presented.

Chapter Four provides a discussion of the findings and results and Chapter Five the conclusions and recommendations

CHAPTER TWO
LITERATURE REVIEW

2.1 INTRODUCTION

In endeavouring to introduce the reader to the subject of costing it is necessary to have an understanding of the principles of accounting as applied generally within business, where it comes from, how it is practised and what the current methods being deployed within South African Airways (SAA) are. This chapter begins with the probing question as to why a business exists.

Different writers at various times have defined the motive force behind any business. Some claim that a business exists to provide a product or service which will satisfy the need created by the public; others claim that a business exists in order to provide means of livelihood by its employment of workers. (Hartley et al 1992: 1)

Whilst both of these objectives may be present, neither could be fulfilled were it not for the one all important necessity behind any commercial business unit: 'the need to be financially viable'. (Hartley et al 1992:1)

There are two aspects to financial viability:

- the need to make profit in the long term
- the need to generate cash flow and thus stay solvent in the short term.

If a business does not see financial viability as its prime objective, it may not be able to provide products and services or to keep workers in employment. Profit to a business is like food to a human being, the body must grow and develop with the assistance of food; take away the supply of food and the body eventually dies. (Hartley et al 1992:1).

However, there are certain types of business to which profit motive cannot apply such as business engaged in the provision of a necessary service to the community (e.g. hospitals, research associations and, until recently, Transnet and its subsidiary South African Airways). These business existed for that very purpose and not essentially for making profit. (Hartley et al 1992:1). In this case, financial viability should be interpreted as the desire to provide the service as economically and efficiently as possible.

Opinions are frequently expressed as to the role of state and quasi -state industries: should these industries be motivated by profit or some other motive based on national interest? (Hartley et al 1992:1) In the pre apartheid years, South African Airways, the official flag carrier for the government of the day existed as a strategic tool providing essential air services to the citizens of South Africa and other users. Being one of five concerns included in the statutory body known as South African Transport Services (SATS), it was not until 1 April 1990 that SAA was required to begin reporting in terms of the Company Act and to operate as a separate entity within SATS. (Deloitte, Haskins & Sells 1989:1) In the years leading up to democracy in 1994 and subsequent implementation thereafter SAA now faces new challenges such as impending privatisation and continued financial viability in the face of increased competition and change (Flight Path Airline News, Chief Executives column, December 1997).

If it is established that financial viability is essential to the existence of a commercial business, it follows that there must be some system which records what is happening in the business day by day, with a view to measuring the ultimate profit achieved. Such a system of recording and measuring is provided by the accountant and the process is called accounting (Hartley et al 1992:2).

2.2 ACCOUNTING PRINCIPLES

The accountant, whatever his or her title may be, is the specialist operator in his or her field: the field of providing a vital service to management in its pursuance of financial viability. This service has two clearly defined aspects which may in fact be regarded as twin fields of accounting, namely financial and managerial (Hartley et al 1992:2).

Financial accounting focuses primarily on historical reports, and is intended for external users such as unions, the receiver of revenue and other outsiders whereas managerial accounting serves the firm's internal needs by providing recent and future-orientated information (Engler, 1993:4).

Although bookkeeping has existed for a long period, the demand for management accounting information (information about activities and transactions within an organisation) is a much more recent development (Johnson & Kaplan 1987: 1). The early management systems concentrated on conversion costs and produced summary measures such as cost per hour and cost per ton. This was normally the product of direct costs such as labour and material and an overhead allocation. The goals of these systems were to identify the different costs for the semi and finished products as well as information on efficiencies and productivity measures (Johnson & Kaplan 1987: 1).

These early management accounting systems were established in the early 19th. century and were primarily intended to ensure the effective and efficient execution of the mono activities of the industries they were serving. Financial and managerial accounting were still operating independently of each other (Johnson & Kaplan 1987: 2).

Towards the latter half of the century management accounting produced standards such as standard costing. This was primarily used in decision making exercises. The final developments in management accounting occurred in the early decades of this century with the emergence of multi-activity diversified corporations. More intricate measures became necessary to manage these organisations as the number of products produced and the markets serviced increased. The development here was largely done by engineers for their own use. The information contained a lot of detail and was highly suited to product costing and management decision making (Johnson & Kaplan 1987: 4).

The problem of how to allocate capital was effectively addressed by F. Donaldson Brown from the Du Pont Corporation (Johnson & Kaplan, 1987:11) by the introduction of a return on investment approach (ROI) concept. ROI was used to measure upper levels of management while departmental levels of management were still measured on efficiencies and productivity.

By 1985, virtually all management accounting practices used today had been developed: budgets for cash, income and capital, cost accounts, flexible budgets, sales forecasts, standard costs, variance analysis, transfer prices and divisional performance (Johnson & Kaplan, 1987:12).

The main purpose of accounting then is to provide information to decision makers. Accordingly, accounting is the process of :

- measuring/assigning rand amounts.
- recording
- classifying/grouping similar items.
- summarising/combining groups of items

- reporting transactions and events of a financial nature and then communicating this information to users of this information.

Accounting as indicated may thus be divided into two areas, financial and managerial. Financial accounting on the one hand serves the needs of external users such as investors, creditors, employees and their unions. Managerial accounting on the other hand specialises in providing information that an organisation's managers find useful for internal decision making.

Thus a firm's internal accounting information system should (Engler, 1993:3):

- enable managers to plan for the operations of their business
- assess how effectively their plans are being implemented
- provide the data needed to control operations
- provide the data for decision making

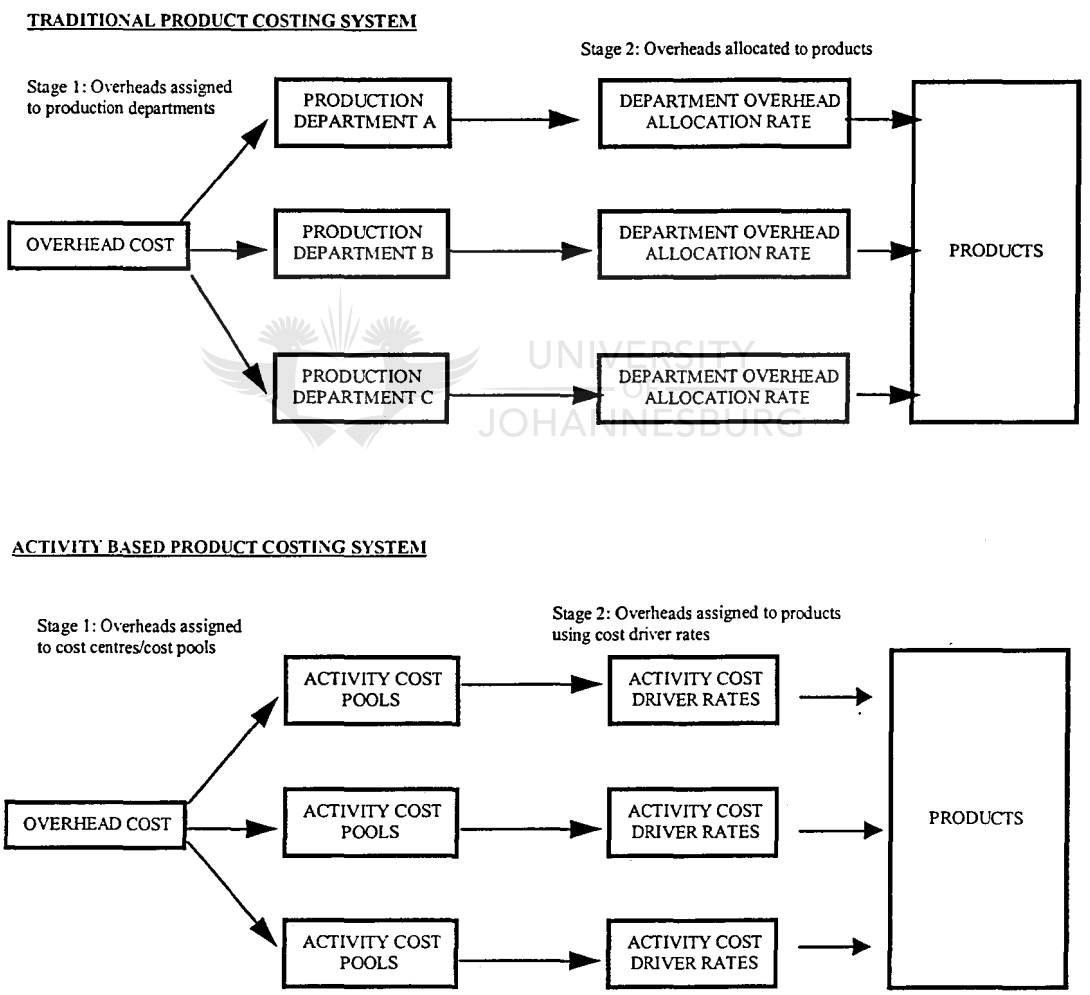
Of necessity, some information that managers need is historical in nature, but most of it is either very recent or future orientated (Engler, 1993:4).

SAA is facing possibly the greatest challenge it has ever faced, externally there are increased competitive pressures with deregulation occurring, increasing cost containment constraints being placed on the operation and political and technological pressures continuing to be applied. On the internal front there are challenges arising from commercialisation, impending privatisation, the need for responsibility accounting, decentralised control and from the possible need to diversify. To rise to the expectations and resist these pressures, SAA requires an integrated cost and profit management system which provides accessible, meaningful and timeous management information to all levels of responsibility, with the advantage of modern integrated real time software (Deloitte Haskins, Sells 1989:3). But before expounding on this system, it

is necessary to differentiate between the traditional costing system and ABC systems as implemented by SAA. This difference is explained in Figure 2.1

2.3 PRODUCT COSTING SYSTEMS

Figure 2.1 PRODUCT COSTING SYSTEMS



As illustrated in figure 2.1, traditional costing systems assign overheads to production departments based on volume related measures such as direct labour hour or machine hours and then allocates it to the products. The negative aspect of this system is that the overhead may be proportioned incorrectly to a specific product which at the end of the day may distort the facts.

ABC is basically a four step process:

- identify the activity
- create a cost centre for each activity
- determine the cost driver for each activity
- trace the cost of each activity according to demand

The major difference between the two systems is that ABC costing proportions overheads more accurately (Engler 1993:4).

This difference is more easily explained using the following example:
Assume a company produces two products screws & nails . Both are produced on the same equipment and use similar processes. The products differ by volume only. Screws is a low volume product while nails is a high volume product. Details of product inputs, product outputs and the cost activities are as follows:

Table 2.1 Input required for production

	Machine hours per unit	Direct labour hours	Annual output units	Total machine hours	Total direct labour	No. Of purchase orders	No. Of set ups
Screws	2	4	1000	2000	4000	80	40
Nails	2	4	10000	20000	40000	160	60
				22000	44000	240	100

The cost of the activities are as follows:

Table 2.2 Cost of activities

Volume related	R 110,000
Purchasing related	R 120,000
Set up related	R210,000
	R 440,000

Table 2.3 Traditional volume - based costing system

Cost centre allocated costs	R 440,000
Overhead rate per machine hour	R 20 (R440,000/22000 Hours)
Overhead rate per labour hour	R 10 (R440,000/44000 Hours)
Cost per unit screws	R 40 (2 Machine hours at R20 or 4 Direct labour hours)
Cost per unit nails	R 40 (2 Machine hours)
Total cost allocated to screws	R 40,000 (1000* R40)
Total cost allocated to nails	R 400,000 (10000* R40)

The cost per unit for traditional costing then is as follows:

Screws: R40.00

Nails: R40.00

Table 2.4 ABC Costing

	Volume related	Purchasing related	Set up related
Costs traced to activities	R 110,000	R120,000	R210,000
Cost drivers	22,000 machine hours	240 purchase orders	100 set ups
Cost per unit of consumption	R5 per machine hour	R 500 per order	R 2100 per set up
Costs traced to screws	R 10,000 (200*R5)	R 40,000 (80*R500)	R 84,000 (40*R2100)
Costs traced to nails	R100,000 (20000*R5)	R 80,000 (160*R 500)	R 126,000 (60* R2100)

The cost per unit for ABC then is as follows:

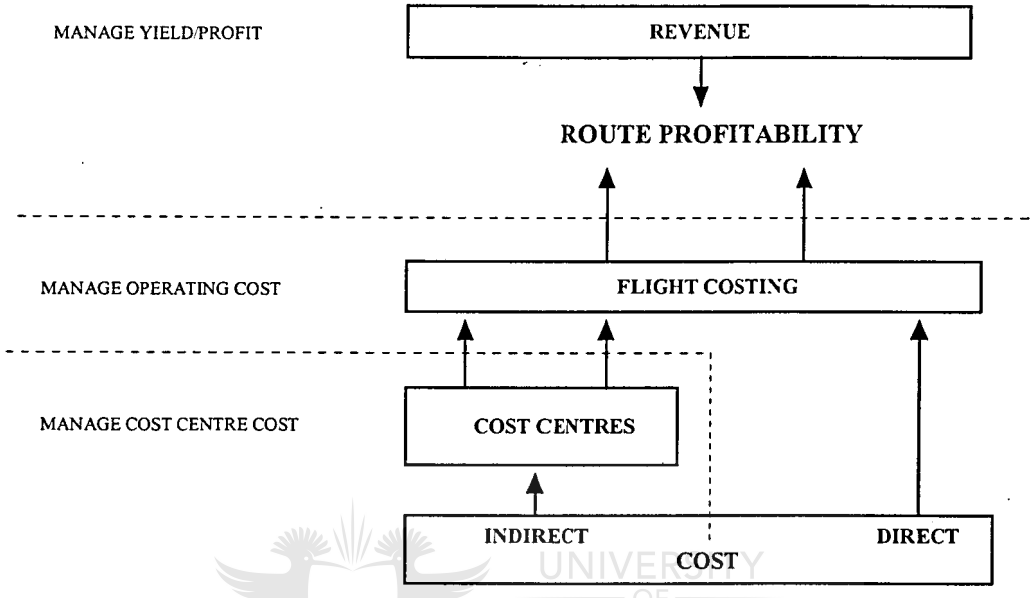
Screws: R 134.00	(R10,000+ R40,000+R84,000)/1000 units
Nails: R 30.60	(R100,000+R80,000+R126,000)/10000 units

As can be seen from the above example, the product costing of ABC is significantly different when compared to traditional volume based costing.
With this concept of ABC in mind, the SAA situation may be further explained.

2.4 COST AND PROFIT MANAGEMENT WITHIN SAA

As indicated previously, an organisation exists to convert cost into products or services and to maximise revenues and profit (Deloitte Haskins & Sells 1989: 3). To manage profit, it is important to accurately measure the full and marginal cost of each profit. Accurate product costing requires accurate standards for the direct cost of a product such as charges for flight fuel in the case of SAA. In addition the product must be charged with the indirect costs of the cost centres performing the activities required to produce these costs in relation to the amount of work involved, an example being preparing the aircraft for a flight. Among these activities are preparing meals, cleaning the aircraft, etc. (Deloitte Haskins & Sells 1989:3). These activities are isolated in cost centres, the costs of which have to be allocated to the products in relation to the amount of work the cost centre performs on behalf of them. The SAA situation is illustrated in Figure 2.2

Figure 2.2 COST AND PROFIT MANAGEMENT FOR SAA



For SAA to maximise its performance, it is essential that each manager has the tools to manage his area of responsibility effectively and in each case it must be possible to measure his performance against a budget for which he can be held accountable. Achieving this is through a zero based plan i.e. no previous activity or historical information is used for each area. This plan must flex to adjust for changes in the level of activity and to enable the isolation of the variances within and outside the control of management in all areas of responsibility (Deloitte Haskins & Sells, 1989:3).

The route manager's responsibility is as illustrated in figure 2.2 and indicated below.

- **the management of profitability:**

  a route manager's performance can only fairly be measured in terms of the revenue and contribution he has generated after being charged a standard cost for the flight.

  Thereafter, he can be held responsible for the price, volume and mix variances in revenue and contribution.

- **the management of operating cost:**

  if it cost commercial operations more to provide the flight than was allowed for in the standard, it is operational management's responsibility. They are held

  accountable for the price and usage variances within their control, which have to be carried by the airline as a whole.

- **the management of cost centre cost:**

  each cost centre manager in SAA (and technical for that matter) must receive monthly information with respect to his cost performance. This person can only be held responsible for cost overruns resulting from usage, and as a result the price and activity variances outside his control must be isolated from his usage variances.

  It is within the sphere of the management of a cost centre that the research will occur.

  In each case it is essential that each manager has the tools to manage effectively and that his performance is measured against a budget based on standards for which he can be held responsible (Deloitte Haskins & Sells, 1989:17).

To determine costs in either a manufacturing, merchandising or service environment, the likes of labour hours, machine hour utilisation, material usage, overheads, etc. need to be reported accurately. Omission of any of these items will lead to incorrect pricing, decisions and policies which, if not corrected, can lead to failure of a business (Engler, 1993:311).

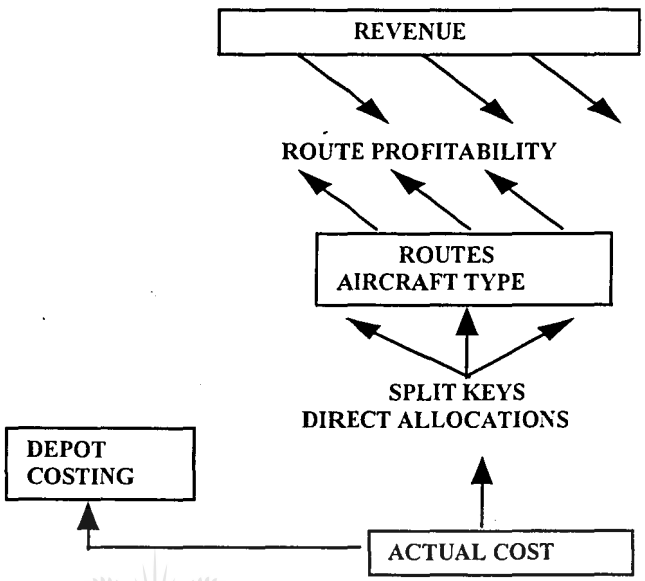
The advantage of an Activity Based Costing system (ABC) over traditional costing provides many benefits. But before expanding on the theory, it is necessary to distinguish more thoroughly between traditional and ABC costing systems as applied by SAA.

2.4.1 Traditional or full absorption costing

In traditional costing, applying overhead to production is usually a two stage process. Overhead costs for a multi product firm are first accumulated by department and then assigned to products using a base such as direct labour or machine hours (Engler,1993: 312).

Many firms with multiple product lines use accounting systems that are outmoded because they apply overhead to production as if they were a single product firm. This is also known in broad terms as full absorption cost approach. Most of the costs are outside the managers control and profitability can be effected by irregular expenditure (Deloitte Haskins & Sells 1990). To further illustrate this aspect within SAA it is necessary to go back to pre 1990 and revisit the full absorption costing as it was then being applied. Figure 2.3 illustrates.

Figure 2.3 FULL ABSORPTION COSTING



In the full absorption philosophy, all actual cost per cost type is allocated or absorbed onto the routes and aircraft types by means of split keys and direct allocations with the following problems being encountered.

The revenues and expenditures being compared to arrive at the profitability covered different periods i.e. the revenue cycle was running from the beginning of the calendar month while the expenditure cycle was running from the 16th of the previous month to the 15th of the next month.

The route manager could not be held responsible for the route profitability as it currently was for a number of reasons (Deloitte Haskins & Sells 1989:20), (figure 2.3).

- The difference in revenue and expenditure cycles meant that like was not been compared with like, which distorted results.
- The routes absorbed all the costs of the airline, many of which are outside the manager's responsibility and control e.g. actual maintenance charges, administrative costs etc.
- Variances which are the responsibility of other areas in SAA were not isolated for the attention of the relevant manager, but were absorbed fully onto the routes e.g. a cost overrun in a particular department is simply carried by all the routes.

A more sophisticated approach to overhead costing is to search for causal factors when overhead is occurred, as in ABC systems.

2.4.2 ABC costing

General definition:

"Activity based costing is a method that creates a cost pool for each event or transaction (activity) in an organisation that acts as a cost driver. Overhead costs are then assigned to products or services on a basis of the number of these events or transactions that the product or service has generated. This sets the base for Activity Based Budgeting (ABB) and Activity Based Planning (ABP) exercises" (Garrisdon RH & Noreen RW, 1994). (also reference figure 2.1 and figure 2.3).

ABC is also a two-stage process; as in absorption costing. In the first stage costs are traced to the various *activities* performed by a firm. In the second stage these costs are assigned to the firm's products or services (Engler, 1993:313). During the first stage overhead costs are accumulated into separate pools using cost drivers as the base for analysing the overhead. Then for each overhead pool a rate is computed in much the

same way as traditional costing. The second stage is then to assign overhead to product costs using the appropriate cost driver as the base. (Engler, 1993:311)

This causal factor or cost driver is the principal of operation of ABC and could include some of the following cost drivers: (Engler, 1993:312)

- number of set-ups
- number of direct labour hours
- number of inspections
- number of machine hours

Since all of an organisation's activities exist to support the production and delivery of today's goods and services, they should all be considered product costs.
(Engler, 1993: 315)

2.4.3 Benefits of the activity based approach

- Gives a more accurate unit cost where a range of products or services whose manufacture or service cost absorbs different amounts of overhead because of variation in volume and complexity.
- Enhances identification of waste and understanding of the factors that cause cost.
- Allows better business planning through:
    - Customer profiling
    - Life - cycle modelling
    - Product and Service Profitability

- An ABC system can paint a picture of product costs radically different from data generated by traditional systems. These differences arise because of the systems

more sophisticated approach to attributing overheads and other organisational resources, first to activities and then to the products that create demand for these indirect resources (Cooper & Caplan, 1988).

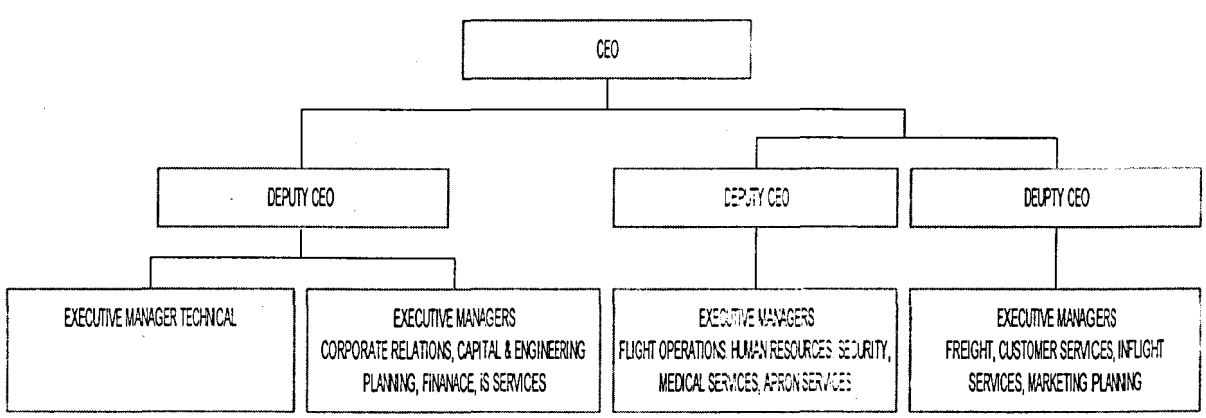
2.4.4 Conclusion

SAA Technical management acknowledges the positive aspects and concepts which ABC provides, such as being armed with more reliable cost information which would enable them to ponder a greater range of strategic options (Cooper & Caplan, 1988), but management within SAA Technical has still not been able to utilise the full benefits ABC provides because of poor labour reporting (a direct cost). For this reason a further explanation is now necessary.

2.5 SAA STRUCTURE

The current SAA structure is as presented below in figure 2.4

Figure 2.4 SOUTH AFRICAN AIRWAYS MANAGEMENT STRUCTURE



South African Airways' structure consists of a Chief Executive Officer and three deputies. Each of the deputies have various numbers of senior managers reporting to them as indicated in figure 2.4 above.

The research, as indicated, will be concentrating within SAA Technical who's responsibility it is ensuring serviceable aircraft for commercial operations. SAA technical relies on amongst others, support from the Technical Finance and IS departments.

The IS department on the one hand is responsible for the maintenance and development of all the computers and associated programs necessary to support the day to day operation and to achieve this objective deploy programs such as Memis and SAP (descriptions of which follow further in this chapter).

The Technical Finance Department on the other hand is responsible for the financial control and recording within SAA Technical and within the context of this study, may also be viewed as being users of the SAP system. This department thus provides advice on financial matters to the SAA Technical management. Within the SAP system is the CO-Controlling module, which essentially forms the costing control or ABC system within SAA (Using SAP R/3, 1996:269).

Maintaining competitive edge or advantage is crucial within any business and requires that the pricing structure of the product is accurate. Product costing is the commonest use of ABC and often forms the basis for product pricing and product profitability (Mabberley, 1992:127).

Within the airline industry of South Africa, SAA has higher overheads in relation to other operators mainly because of the large infrastructure that it supports. This infrastructure which consists of approximately 10,000 employees is spread across different activities such as technical maintenance, flight operations, information systems, commercial operations, and cargo and exist, to support the day to day operation. The smaller operators such as the now amalgamated British Airways/Comair, Sun Air and Airlink do not have large capital intensive operations such as comprehensive technical overhaul capability, large employee numbers, loan repayments and financing costs and, in a large percentage of cases, lease aircraft as opposed to outright purchases. These effects naturally reduce the capital and infrastructure overhead thus lending their operations to more manageable cost control (Clarke, 1997).

ABC systems should and do provide this cost information within SAA to meet the ends of cost control, however the problem that is arising within SAA Technical in particular is the lack of precise labour hour recording which ultimately leads to a inaccurate product costs.

This omission or, in technical terms - labour hour under recovery - is frustrating to management and decision makers who because of the situation may interpret costs incorrectly and implement decisions and strategies which could be detrimental to the operation. For these reasons it is imperative that accurate recording of labour hours is ensured.

In determining whether SAA Technical is any worse than the rest of the airlines', it is important to overview the methods other service providers use to record labour hours. and is as follows.

2.5.1 SAA Technical

SAA Technical uses a task card allocation for checks and inspections on aircraft. The allocated hours for these cards have been derived and tuned from experience gained over the years and at this stage represent a reasonable value. The hours captured from these cards are used by the production planning department for future manpower and material planning, but not for labour reporting. The labour reporting is achieved through a manually completed time sheet or, currently in the implementation phase, bar scanning method (cf. 2.6.3). These aspects are explained further on in this chapter.

2.5.2 Denel Aviation

The maintenance aspect of Denel is performed by a subsidiary company called DATAM, an acronym for Denel Aviation Transport Aircraft Maintenance and was established primarily to cater for third party work. The functions that this subsidiary performs is for all intents similar to what SAA Technical provides and uses the following methods for labour reporting (Willis, 1997).

Labour reporting is achieved via the capturing of routine and non routine maintenance cards. The routine cards have manufacturer derived standard hours assigned and are primarily used as inspection tasks performed during the aircraft check. These tasks typically encompass activities such as panel removal, cable inspection, removal of components, etc. The non routine cards on the other hand are generated during an inspection when a defect is identified. The hours assigned to the non routine cards are estimated by the technician, confirmed by the supervisor and, if the defect is of a serious enough nature then the hours required to perform the corrective action is confirmed by the aircraft company representative. Once the technician has signed and

accounted for the hours on the card, the tasks hours are manually captured (Willis, 1997).

DATAM, within the last eight weeks, has replaced the manual recording system with a bar coding type which will perform a similar function to SAA Technical's bar coding system. The major difference between the two is type and functionality of the computer systems. In DATAM's case the computer system is called Oasis (Willis, 1997).

Precisely how efficient the bar coding system will be is difficult to ascertain as it is proprietary information, but the reason why DATAM is migrating from a manual system to a bar coding system is primarily due to the need for accurate costing and due to inaccuracies which arise from technicians being allowed the freedom of discretionary accountability, e.g. using the full allotted hours when in fact the task was completed in a shorter period.

The problems and quest's as evidenced so far are similar to what SAA Technical is experiencing.

2.5.3 Comair

As Comair uses SAA's Technical capability for major and phased maintenance with minimal technicians required for flight line maintenance, this operation for all intents and purposes may be excluded from this study.

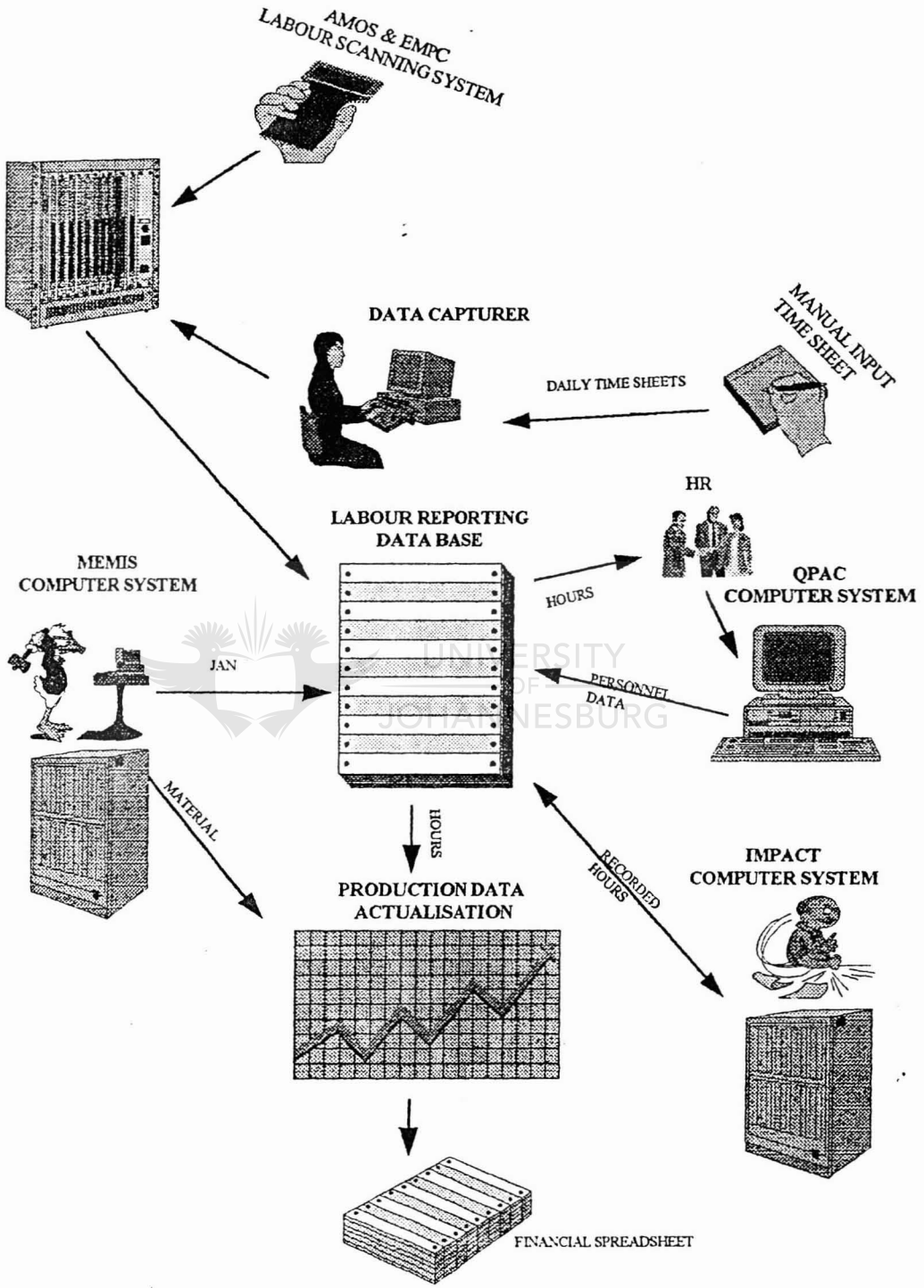
2.5.4 Sun Air

Sun Air operates and services their own fleet of aircraft with a similar manual routine/ non-routine card system being deployed on the maintenance side. As the same deficiencies as indicated for SAA Technical and DATAM are evident in a manual system then, if costs are to be more accurately calculated a bar scanning system will be required. However this may not be absolutely necessary at this stage as Sun Air performs no third party work (Willis, 1997).

2.6 LABOUR REPORTING AND THE VARIOUS COMPUTER SYSTEMS

In further assisting the reader in of understanding the problem of labour hour under recoveries within SAA Technical, an explanation of the computer systems, their historical background, interaction, functions and current status is necessary. This is presented in Figure 2.5 and is as follows:

Figure 2.5 LABOUR REPORTING AND THE VARIOUS COMPUTER SYSTEMS



2.7 MEMIS

An acronym for Maintenance and Engineering Management Information System (used by SAA Technical for over 15 years), is an Italian developed computer program that was initially purchased to automate the stores, component tracking and inventory control systems of SAA Technical. This computer system has over the years proved to be a reasonably reliable and accurate asset and has subsequently been further developed by Alitalia in conjunction with SAA to provide additional technical functions that were deemed necessary to improve and maintain competitive advantage (Memis Computer system). These additional functions provided by Memis are:

2.7.1 Manual time sheet capturing

The manual process of recording labour hours via a time sheet within SAA Technical is still the main form of data capture and although this method is currently being superseded by Amos and Empc (descriptions follow), some departments will continue to operate under the manual time sheet method (Zahn, 1997).

The time sheets and reasons why, where and how well they are operating will form one aspect of the research.

2.7.2 Labour Reporting

This program and database forms the heart of the current Memis system and consists of, amongst other functions, a table of all time sheet staff actively involved in labour reporting within SAA Technical. As rapid development within Technical occurs, new programs are written and with the changing computer environments, it is essential that

the integrity and accuracy of the Memis data base be ensured and maintained, keeping in mind that systems provide erroneous and misleading information if they are not correctly administered. This labour reporting aspect and the environment that it occurs in is extremely important for decision making, financial and management reporting functions and for this reason forms the central focus of the investigation. It should be noted that the labour reporting database will eventually automatically be updated by Qpac's database. In theory it should then be a mirror image (Zahn, 1997).

2.7.3 Amos

An acronym for **A**ircraft **M**aintenance and **O**verhaul **S**ystem. (currently in the development and implementation phase), Amos is a program conceived and developed by Alitalia to automate the scheduling of aircraft maintenance as required by the aviation authorities. It is also used to control the planning of the actual work when the aircraft is in the hanger and to schedule the required tasks accordingly. Amos is specifically written and customised for the aircraft maintenance environment. It was also a requirement at the implementation stage of the Amos development that the labour reporting side of the operation be automated as manual control was continuing to be ineffective in some areas (Zahn, 1997).

This automation lead to the introduction of the **bar scanning or coding** system. Bar coding is the most commonly accepted technology used today for automatic data collection and is an arrangement of bars and spaces that represent individual numbers, letters, and punctuation marks. When a scanner illuminates the bar code, the reflected light is transformed into electrical impulses. A decoder translates these electrical impulses into binary code for use by other devices such as computers (Boeing July-September, 1997).

During the past 30 years, commercial applications of bar code have extended to virtually every industry, and include point-of-sale transactions, inventory control, shipping and receiving, and time and attendance monitoring. Now, the aviation industry is eager to take advantage of bar code technology to increase productivity and reduce costs (Boeing July-September 1997:25).

The accuracy of bar scanning is high with one airline which was surveyed revealing that data error was one in every 15 characters entered manually, in contrast to an error rate for machine-read bar codes being approximately one in three million (Boeing July-September 1997:25).

The replacement of the manual recording system with bar coding has resulted in the advent of a second program called Empc which will take care of the labour recording within the support workshop's environment.

2.7.4 EMPC

An acronym for **E**ngine **M**aintenance **P**roduction **C**ontrol program, is a program in the development phase. This program essentially performs the same function as Amos, the only real difference being that it is customised for the support workshop type of environment. Implementation and beta testing of this program should occur during the months of September/October 1997 (Zahn, 1997).

2.7.5 QPAC

An acronym for **Q pac**kage programs (supplied by QData), is a program that performs the human resource and remuneration calculation side of SAA's operation and will in

the foreseeable future update the labour reporting data base. The logic behind updating the labour reporting data base with Qpac's data base is that the control for staff transfers, resignations, promotions, pensions, etc. should be a function performed and controlled by the Human Resource office. This should lead to greater data integrity in the long run and also improved central control. Exactly when automated updating of the labour reporting database will occur is not known at this time, as it is an ongoing development. Current estimates put it at approximately nine to twelve months from now and for this reason the labour reporting data base continues to be manually, and as far as possible accurately maintained by the Memis personnel (Zahn, 1997).

2.7.6 PDA

An acronym for **P**roduction **D**ata **A**ctualisation, is a program which can be used to report on material usage, labour hours recorded on the job etc. It is largely not used at this stage, as reports are being derived via other computer reports generated by the Memis system thus rendering PDA's continued existence questionable (Zahn, 1997).

2.8 SAP

An acronym for **S**ystems **A**pplications and **P**rocesses - is a German developed, internationally accepted, holistically integrated software package, serving the needs of hundreds of corporations world-wide (Using SAP R/3, 1996). It also has a large customer base and following within Southern Africa, SAA being one of the customers. Amongst the diverse functions that SAP can perform are:

- Financial Management
- Production Planning
- Plant Maintenance

- Sales and Distribution
- Human Resources
- Materials Management

SAA Technical, as does the rest of SAA, uses the SAP system for financial accounting purposes, the functions of which can and are customised for a particular environment. It operates in and is commonly known to the SAA staff as IMPACT, an acronym for **I**ntegrated **M**anagement of **P**rofit **A**nd **C**os**T**. As this investigation is focused on the problems being experienced within SAA Technical, only the computer programs applicable to and affecting SAA technical will be discussed which in this instance is the SAP cost accounting module (Zahn, 1997).

2. 9 COMPUTER INTERACTION

The interaction then between the Memis and SAP computer systems is as follows:

- The labour hours and job account numbers from the various cost centres are expected to be captured on a daily basis. These hours which are captured either manually via a time sheet or, automatically via the bar scanning medium are then stored in the Memis computer system.

- During this capturing process, data validation occurs within Memis for all job account numbers, pension numbers etc. and are checked to ensure that the data is compatible with what the SAP computer system expects and recognises. This validation process within Memis is necessary as the total number of hours and job account numbers performed per employee are transferred across to the

SAP/IMPACT computer system monthly and cannot be verified at the end of the month as this is practically impossible.

- Filtering of errors within Memis is performed prior to the data transfer and corrections are made before this information is finally transferred and converted into financial reports, which are eventually distributed to the various cost centre managers. Once the managers receive this information analysis, trends may be drawn.

- One of the objectives of the departments receiving this financial information is to monitor and eliminate the under recoveries or to be as close to budgeted man hours as possible and forms part of the managers' key performance area (KPA) measurement.

This phenomenon of under recovery is the item that is being investigated, why it is occurring and which shall form the basis of the investigation.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1 INTRODUCTION

In this chapter, a more comprehensive overview of the research design, and methodology orientation is provided. This will be followed by a discussion of the Memis LBR001 report, it's relevance to the subject, subsequent analysis drawn and finally, the questionnaire with it's relevance and derived data. The flow chart and design is as presented below in figure 3.1

Figure 3.1 DESIGN FLOW CHART

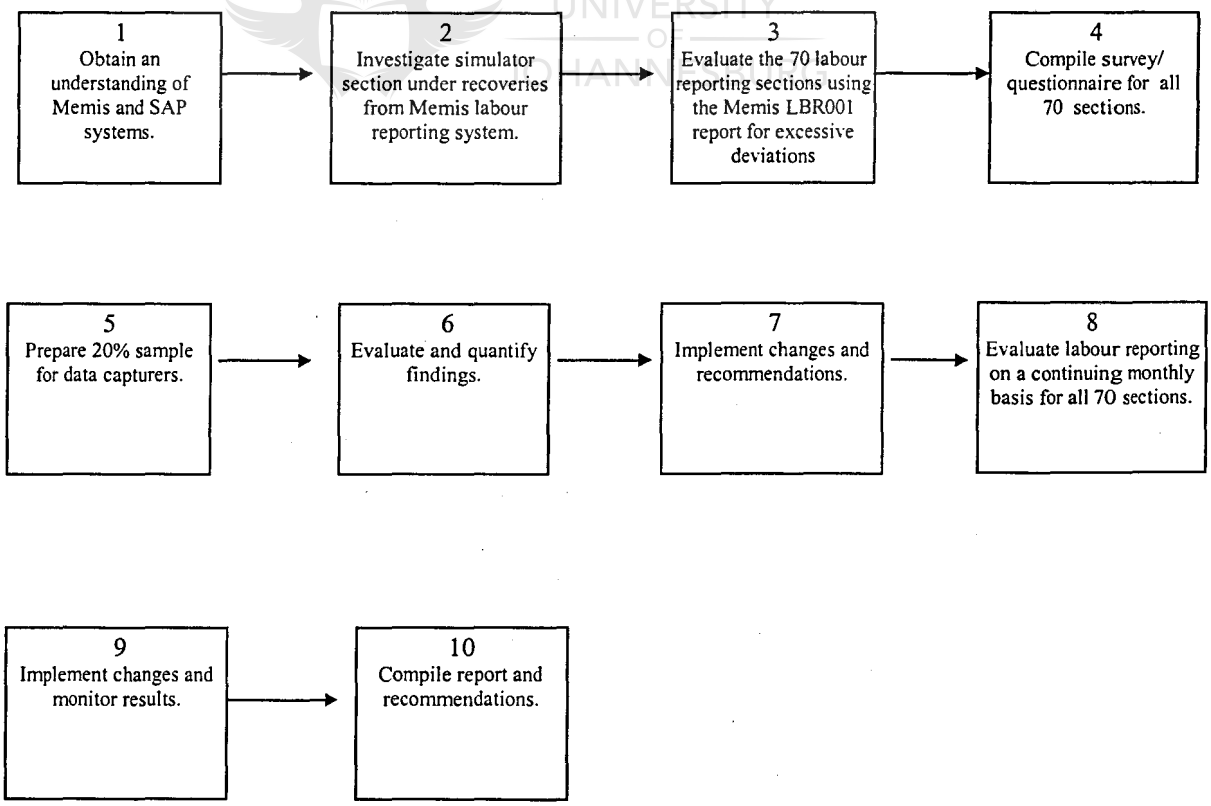


Figure 3.1 illustrated above, is a diagrammatic and logical guide used by the researcher in ensuring the end result. The ten steps used in achieving this objective are as described below.

The first step was to gain an insight and understanding of the Computer systems involved in the process of labour reporting and capture. Once this objective had been achieved and a firm understanding attained on what labour reporting is and how it all ties together, the focus was directed to the simulator section and upon which a preliminary audit was performed.

The second step and, primary reason for the initial investigation concentrating within the simulator department, was because of it's relative ease in being able to consult, discuss, and debate with the management and role players concerned, all of whom have a good understanding of systems, methods and operations as applied within SAA Technical.

The third step was to evaluate for excessive deviations on an individual basis, the 70 sections reporting on labour hours. In this instance the Memis LBR001 report was used. The labour hour percentages per cost centre from January through to September 1997 were quantified and the accuracy of the LBR001 report and computer transfer routines investigated.

The fourth and fifth step was to compile the questionnaire and 20% employee sample and deliver them to the sections concerned. These sections were then given a month in which to respond and return the required information.

The sixth through to the ninth steps involved the evaluation and quantification of the primary data, subsequent feedback provided to determine the reasons for the anomalies and, where changes were necessary, recommendations implemented to improve the operation.

As change would invariably be required, it was deemed necessary to include ongoing monitoring and analysis until the end of September 1997 from whence the research would cease. The tenth and final step would be the compilation and report drafting.

3.2 RESEARCH METHODOLOGY ORIENTATION

The research results which consisted of both empirical and quantitative natures were used to provide improved systems, accuracy and methods for SAA technical.

The secondary data source for the research was the Memis LBR001 report. This report, which is distributed to all cost centres, is used to determine the operating efficiency and labour utilisation of the section concerned.
Initial analysis of the LBR001 reports revealed that across the 70 cost centres, the number of hours missing was averaging out at about 35 percent up to and including the month of June (cf. 4.3). Obviously this figure was inordinately high and all efforts were in progress to improve the situation.

The LBR001 report which is generated by Memis, is an accumulation of monthly recorded hours per individual for a particular section and from this report, an individual's as well as section's monthly productivity and performance may be monitored. As this report contains information which may cast a section in either a positive or negative light,

it makes sense that the data used and presented must be accurate and for these reasons this report was thoroughly investigated to determine whether this was indeed the case.

After research, it became evident that this document was confusing, erroneous and difficult for the sections to interpret, which was leading to rejection and dissatisfaction amongst the users.

The anomalies in the LBR001 report were largely due to incorrect personnel assignments, supervisory staff being inadvertently assigned time sheet status and general lack of accuracy.

To ensure that the missing hours were not solely confined to Memis and it's capturing process, the transfer routine between Memis and SAP was also investigated (cf. 4.4).
In this part of the investigation, the total number of hours captured per section as reflected by the LBR001 report was compared to the SAP reflected totals. Again discrepancies were evident and tended to average out at about 7 percent over a four month period. This fact was brought to the attention of the people concerned who subsequently investigated further and acknowledged a programming error. This programming error was rectified but the improvement is difficult to quantify, the reasons for which are presented in chapter four.

At this stage a general picture of what was transpiring was becoming clearer, and the questionnaire and 20% sample for the data capturers was drafted and distributed to all sections. On receipt of the returned information, the data was analysed and graphs drawn depicting the picture per section (Addendum 1). Only once this procedure was completed was it possible to determine the reasons and trends for the anomalies. This method was repeated seventy times for each affected department.

3.2.1 Discussion of questionnaire

To further clarify the research, the following is provided:

- A description of the question on the survey form with the cumulative results.
- Rationale behind the question, findings and conclusions.
- Responses to question 9 per cost centre, as each area produced a unique set of results.

37 questionnaire's and 20% random samples per section were distributed. Of these, 37 questionnaire's and 33 random samples were returned. The 4 non returned random samples were from jet shop and major maintenance.

Question 1 - Who fills in the time sheets?

Technician	Supervisor	Other
30	3	0

Rationale behind question:

To determine whether supervisor interaction influenced the accuracy of the data and whether supervisor intervention would have produced a different set of results.

Finding:

30 areas responded by answering technician, except Historic flight, Majors and Boeing Avionics maintenance which responded with ' technician and supervisor as per crew arrangement.'

Conclusion:

It is desirable to have each person account for his own actions and in the majority of sections this is the case, however it should be noted that after interviewing the deviating sections concerned, the reasons given were that work schedule deemed otherwise and from further analysis did not appear to be problematic.

Question 2 - When are the time sheet filled in?

Daily	Weekly	Other
33	0	0

Rationale behind question:

To determine whether it was possible that late receipt of time sheets was leading to omissions. If time sheets are not captured daily this could lead to backlogs which may have lead to omissions in some cases.

Findings:

All answered daily, however it should be noted that the aircraft group were in disarray at the beginning of June and only once the data capturers had been moved did the situation in this area show significant improvement.

Conclusion:

Does not warrant further investigation

Question 3 - Is there a check to ensure that each technician has accounted for his work, absence etc.?

Yes	No
33	0

Rationale behind question:

To determine whether time sheet omission is due to a lack of internal control within the department.

Finding:

All sections responded positively and subsequent auditing revealed that in most sections the lead sheet system was in place. This indicated that this method of monitoring is not problematic or require attention at this stage.

Conclusion:

Does not appear to be problematic.

Question 4 - Who captures the time sheets?

Own Clerk	Central location	Other
20	13	

Rationale behind question:

To determine whether central locations of data captures are the problem.

Finding:

65% responded with own clerk. 35% with central location.

Conclusion:

The aircraft group comprising cost centres 8001, 8005, 8007, 8008, 8011, 8012, 8013 8016 and 8142 all reported to a central location, which happened to be situated in the Avionics Building. This building is approximately 500 metres from the actual work areas necessitating hand carrying and delivery of the daily time sheets. Due to reasons such as shift cycles, work load demands, forgetfulness on behalf of supervisory staff etc. this method was not effective and was the major cause of the delay in receipt of time sheets at the central capture point.

As can be seen from the excel report (see addendum) these areas all exhibited high degrees of omission. Due to the severity of the problem, it necessitated pro active correction which could not wait for the full outcome of the findings. This geographically detached data capturing point was

identified by myself and management as being the primary cause of the problem and necessitated immediate action which resulted in mid month relocation of the two data capturers to the two maintenance superintendent's offices located in the hangers. This action resulted in a marked improvement as is evidenced from the graphs supplied.
Other areas with central location data capturers; such as CRS support workshops and civil's did not indicate the same degree of omissions, the reason being that the data capturer is physically located within a few meters from the workshops as opposed to hundreds of meters.

Question 5 - When is the time sheet captured?

Daily	Weekly	Other
30	2	1

Rationale behind question:
To determine whether other than daily capturing could be a cause for concern and if changes needed to be instituted to rectify procedures.

Findings:
all sections answered daily, except for three.

Conclusion:
Does not appear cause for concern. The other three misinterpreted the question.

Question 6 - Is there a check to ensure that there are time sheets for a technician when:

on leave:

Yes	No
32	1

sick:

Yes	No
32	1

attending course:

Yes	No
32	1

acting higher grade:

Yes	No
32	1

on relief:

Yes	No	N/A
32	1	

flying technician:

Yes	No	N/A
32	1	

Rationale behind questions:

To double check question three's response and to gain deeper insight into the various sections procedures for monitoring time sheets.

Findings:

Major Maintenance 8002 responded no to all the above.

Conclusion:

After discussion with the superintendent in Major maintenance, it was agreed that the question was misunderstood and should have been marked as a yes. No cause for procedure amendment.

Question 7 - Can your clerk or data capturer cope with the volume of time sheets to be captured?

Yes	No
32	1

Rationale behind question:

To determine whether investigation would be necessary due to excessive work loads on the data capturers.

Findings:

The one area identified as being problematic and overloaded was Majors, specifically sheet metal 8058.

Conclusion:

This area has been identified as being problematic, and brought to management's attention, from the beginning of September an additional data capturer will be provided for this area.

Question 8 - What would you do to make the system capture more accurately?

Rationale behind question:

To provide additional input from the role players.

Findings:

8058 - metal shop majors	get more data capturers.
8403 -	Each section should capture own sheets.
8024 - radio workshop	all time sheets to be at central location on Monday morning at the latest.
8021 - instrument workshop	our reporting is fairly accurate.
8052 - paint shop	supervisor and data capturer to ensure daily time sheets are loaded correctly.

8053 - trimming workshop	the data capturer has a book to record and cross check.
8011 - interior section	allow the supervisor to do so on a mechanised system, data must be captured within 24 hours after completion of shift. A shift man power report could then be produced by the system and supplied to the superintendent to analyse.
8142 -Avionics Modifications Majors	after checking the Memis summary, it came to my notice that persons on relief have got up to 160 hours missing on their cost centre reports and some of them have been transferred to other cost centres in Memis.
8007 - departures	simplify the job account numbers.
8045 - welding shop	information record page does not turn over
8038 - plating shop	to double check the months captured figures. Phone originator if the job account numbers do not correspond. Query as to why unproductive work only caters for 3 codes.
8559 - maintenance facilities planning	commit myself and my staff to co-operate.
8034 - jet shop long range-	impress on staff importance of booking correctly.
8306 - production inspection jet shop	introduce a bar scanning system. Introduce flexibility into job account number allocation.
8308 - detail bench inspection jet shop	bar scanning

Conclusion:

These are all general suggestions except for one which requested an additional data capturer. None of the responses effectively addresses the problems at hand.

Question 9 - With reference to the Memis Labour report printout:

Mark on the printout any person that is:

- **non time sheet personnel e.g. supervisors, superintendents, etc.**
- **not part of your staff compliment e.g. transferred.**
- **resigned.**
- **on pension.**
- **other.**

Rationale behind task:

To ensure labour reporting data base integrity as reflected by the Memis LBR001 report.

Findings:

For individual analysis see addendum's in chapter five.

3.2.2 Discussion of 20 percent random sample

The intent of this exercise was to determine if the data as reflected by the daily time sheets matched the figures as reflected in the LBR001 report. In achieving this objective, the capturers were required to check the actual time sheet for each individual as requested, and mark in the appropriate block if a time sheet was submitted or not. Once this information was returned, the data was cross checked to determine if the match was correct (Addendum 2).

Although it proved to be inconclusive in a lot of cases as results of individual samples were 100% correct, what the exercise did highlight was the need for stricter control of the monitoring or tracking of time sheets as nearly all sections exhibited to some degree a loss of hours somewhere along the way.
To substantiate the claim that stricter control is required, the following information is provided.

In the table below is representation of the accuracy of returned time sheets from the returned 20% samples for the five major departments.

Table 3.1 Accuracy of returned time sheets

SECTION	ACCURACY
Daily maintenance	61%
Major maintenance	50%
Support workshops	75%
Jet shop	66%
civil operations	73%

As can be seen from the above table, the accuracy is generally quite low which would indicate that stricter control measures across the board are desirable.

3.3 CONCLUSION

It may be concluded that the design as presented should provide the answers to the questions raised and is comprehensive in its design.

CHAPTER FOUR
RESEARCH RESULTS

4.1 INTRODUCTION

In this chapter the results and findings of the survey will be presented and will start with an overview of the methods used in reaching these objectives.

All cost centres which utilise labour reporting were investigated using the Memis LBR001 report as a secondary data source. This report which formed the basis of the research, is the report that the managers receive on a monthly basis and from which conclusions are drawn as to how their section is operating compared to the budgeted figure.

As the LBR001 report is compiled for individual areas or departments and distributed to them on a monthly basis, it was necessary to compile an Excel spreadsheet for the months of January 1997 through to August 1997 to determine the severity of the under recovery problem from a departmental as well as group perspective. This spreadsheet was used in compiling the data to plot the trends and results.

4.2 DISCUSSION OF RESULTS

It became apparent during the investigation that the labour hour discrepancies were largely attributable to a number of reasons of which these are:

- **ineffective operational control methods:**
  from the survey presented in section 4.13 of this chapter, responses to questions 2, 3, 5 & 6 were used to determine whether lack of supervisory or floor level control were the reasons for

the losses. Results indicate that supervisory methods were not the reason for the losses as all sections indicate good control measures, it must therefor be concluded that ineffective operational control methods must be the contributing factor. This statement is espoused by the subsequent improvement, specifically within the aircraft group of once the data capturer's had been relocated and stricter control measures were installed, the missing hours was drastically improved.

- **Geographically dispersed data capturing:**

  Question 4 in section 4.13 of the survey was used to determine whether geographically dispersed capturing was a factor in labour losses. From the information provided by question 4, investigation was conducted into the affected departments, with the subsequent results derived indicating that the aircraft group was the worst affected area. Civil operations, which also has geographically dispersed capturing, did not display the same degree of omission because of tighter control and the physically shorter distance required to deliver the time sheets. Once change was implemented within the aircraft group, dramatically improved results were evident.

- **Computer programming errors:**

  which was acknowledged by the programmer concerned, the results of which are graphically represented in paragraph 4.4 of this chapter.

Less significant but no less still important, are the following items, these are explained in more detail in section 4.5 of this chapter:

- **lending between sections** (20 of the 70 departments may be affected by this phenomenon).
- **machine hour utilisation in applicable departments** (15 out of 70 departments are affected)
- **apprentices appearing on some departments strength from time to time** (all departments may be affected at some stage or the other)

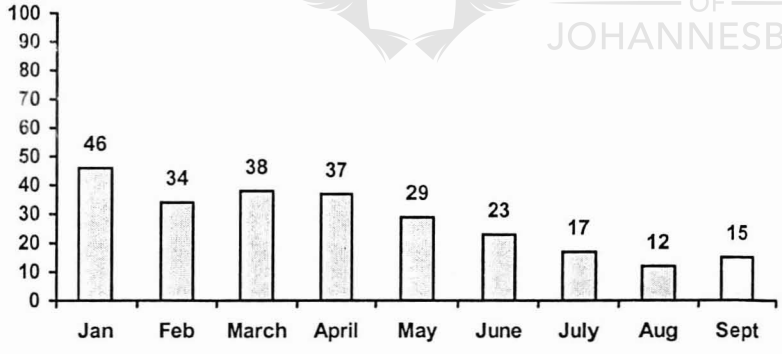
- **shift cycle monitoring** (all departments which have shift cycles are subjected to this possible problem)

Although a number of these items have been rectified, or are in the process of being rectified, they still form an important aspect within the research.

4.3 OVERALL REPRESENTATION OF MISSING HOURS

The month of investigation in which the research occurred and in which all cost centres were surveyed, was June 1997 and for explanatory purposes the following percentage of missing hours for all cost centres reporting on labour hours within technical from January 1997 to August 1997 is provided.

Figure 4.1 Total missing labour hour percentages for all cost centres within SAA Technical



As reflected by the above graph an improvement in under recoveries is quite dramatic, but the question at hand is, can this momentum and improvement be sustained? In trying to provide this answer, the following statistical prediction using the above information and a 10 percent base is made.

From the data, the mean or average number of hours missing for the period of January 1997 through to September 1997 is calculated as being 27.88 percent missing hours with a standard deviation of 11.79 percent missing hours. Using the standard normal probability formula, the following is calculated.

There is only a 12,5% chance of average number of missing hours dropping to less than 10 percent missing hours. (ceteris peribus).
(For calculation see Addendum 3).

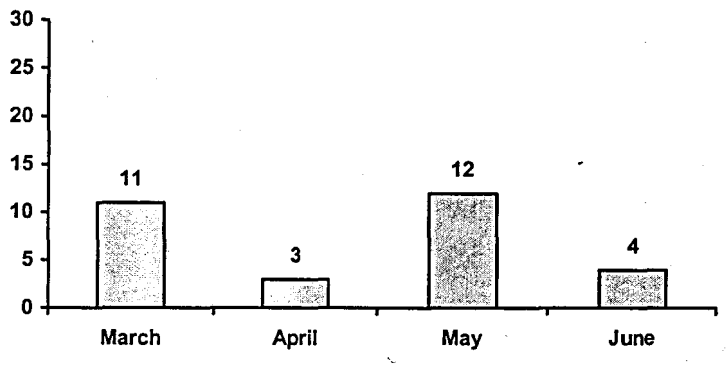
4.4. COMPUTER TRANSFER ROUTINE FINDINGS

The next item that was addressed and investigated was the accuracy of the computer transfer routine where once again the Memis LBR001 report was used as the reference.

To determine the accuracy of the transfer routine a 20% random employee sample from cost centre 8001 was drawn.

The results from this sample using March - June were compared with the information which Impact received. with the following trends being observed in figure 4.2.

Figure 4.2 Memis vs Impact data percentage discrepancy



After discussion during the month of May with the Memis programmer concerned, it was identified that a programming error did indeed exist and that corrective action was necessary.

This problem was subsequently rectified but exactly what the severity was is difficult to ascertain for, as indicated in this chapter - if the data for a previous month that has had a cut off date applied and data from the previous month can continue to be entered into the Memis computer system, then discrepancies will persist.

The assurance was provided by the programmer concerned that data integrity during file transfer program from June onwards is now secure.

4.5 MEMIS LBR001 REPORT ANALYSIS

The next item that was investigated was the accuracy of the Memis LBR001 and associated errors. This report and subsequent feedback derived from the survey's question nine response, provided the following observations and deductions to be made:

- The assigned hours column did not take into account public holidays which in some months could be as high as 24 hours per time sheet employee, this over allocation of man hours per employee for the month obviously further distorted the facts. (This has subsequently been rectified from June onwards).

- If a person is lent to or performs work in another cost centre, the system assigns the full month's hours to both cost centres. This is a fairly serious problem of which 20 departments at any one time may be afflicted. Some months all of these departments may exhibit this problem, other months none. Result - distortion of facts. (not yet rectified).

- In some workshops machine hours are reflected amongst the time sheet staff on the Memis LBR001 report. The Memis program treats a machine like an employee, assigns a pension number and allocates the same number of hours per month as it would a normal employee. If the machine is under utilised it reflects the missing hours as an under recovery with the net result being that further distortion of the hours occurs. To determine the severity of the problem in the workshops reporting on machine hours the percentage of the under recovery attributable to machines was calculated with the following observations.

    - 15 workshops report on machine hours.
    - 72% of the average under recovery for these departments is attributable to machine hour under recoveries.

- If an apprentice is lent in or performs work in another section for a short period of time e.g. seven days, Memis assigns the full months hours allocation. This item will continue to be an ongoing problem until rectified. (not yet rectified)

- The LBR001 report is not real time and can only display accumulated hours per employee versus the months full assigned total. Ideally the assigned and actual columns should track in real time. This is best illustrated by the following example.

  Assume the system assigns 160 hours per employee for the month. If the person works 8 hours per day then on the first day the missing hours would be 152, the next day 144, and so on until at the end of the month if all data had been captured 0 hours would be outstanding.

  Memis currently does not operate according to this principle and requires calculation and arithmetic to interpret the figures correctly. Ideally what it should do is, assign 8 hours per day to the individual as opposed to the full months total of 160 and track assigned hours versus actual hours captured on a daily real time basis. By deploying this method a more realistic and up to date picture will be created.

- Some areas such as major maintenance assign personnel into shift cycles. If a person is lent to another crew for a short period, the list for the crew has to be updated and the system notified of the transfer so that reassignments of hours may be accomplished. Failure to do so leads to labour hour discrepancies.

- Contract workers can appear on the LBR001 as and when work load requires, but due to a misunderstanding on behalf of the supervisors in the months preceding June, the importance of requiring contractors to complete time sheets was not stressed, hence the large under recovery reflected in some departments.

4.6 INHIBITING MEMIS DATA ENTRY AFTER A CLOSING DATE

Another important aspect which will require attention on the manual time sheet side of the recording system is the Memis labour reporting programs inability to limit the entry of the information by the data capturer after the previous months cut off date has been reached. As indicated previously, the accumulated labour hours for the month e.g. June is normally transferred to Impact on the fifth of the month however, the inability of Memis to limit the entry of the previous months data does not exist, the net result being that discrepancies arise between what Memis claims was transferred and what Impact claims to have received. This item requires attention.

4.7 LEAD SHEETS

Another important aspect to the data capturer's task, and the integrity of the labour reporting system for that matter, is the controlling, tracking and monitoring of the submission of time sheets for an individual or crew. This document which is known as a lead sheet, is the one critical item that assists the data capturer in controlling and monitoring the reasons for missing time sheets or hours.

This lead sheet is the medium implemented in most departments and, in areas where no lead sheets are necessary, such as in Simulators, then some other means of tracking such as books or year planners are available. Either way some form of control is implemented in all departments.

From the survey questions 3, 6, & 8, it was evident that all sections tested did have some form of document/book/lead sheet to monitor the situation which again indicates acceptable supervisory control.

4.8 DISCUSSION OF FINDINGS ON FIVE MAJOR GROUPS

In the pages that follow a discussion of the results from the questionnaire will be presented per group. For analytical purposes SAA Technical will be sub divided into five major areas of which these are:

4.8.1 - Aircraft group daily maintenance.

4.8.2 - Aircraft group major maintenance

4.8.3 - Support workshops

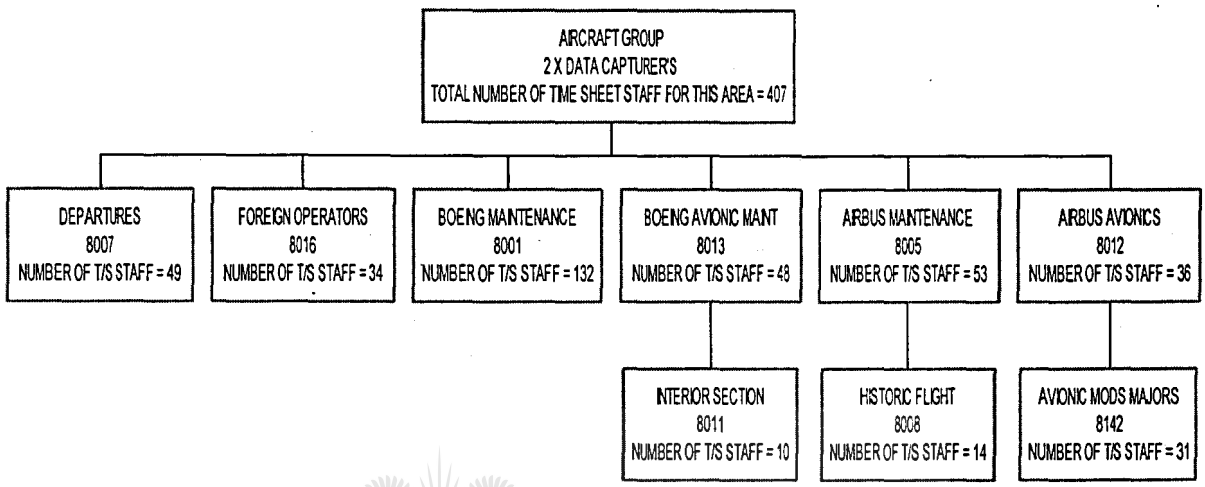
4.8.4 - Jet Engine overhaul workshop

4.8.5 - Civil operations

4.8.1 AIRCRAFT GROUP DAILY MAINTENANCE FINDINGS

The structure for the aircraft group daily maintenance is as depicted in Figure 4.3

Figure 4.3 AIRCRAFT GROUP DAILY MAINTENANCE STRUCTURE



The Aircraft group daily maintenance department, which forms the core of Technical and has the highest number of workers in any specific area (407 time sheet staff), encompasses the following activities:

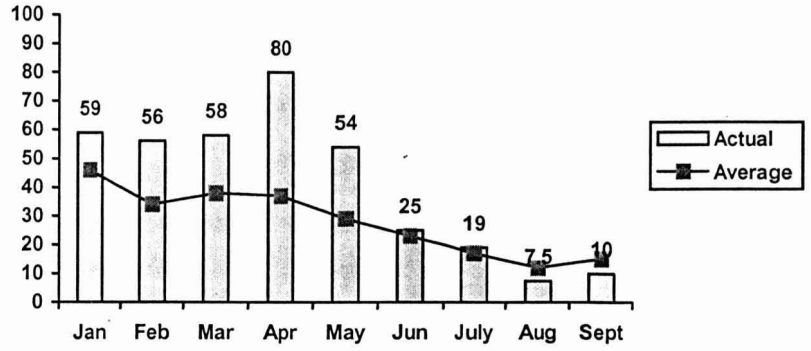
- **Departures** - responsible for the after landing and pre take off checks in departures section of SAA aircraft.
- **Foreign Operators** - responsible for the maintenance and checks on foreign aircraft whilst on turn around in South Africa e.g. (Lufthansa, British Airways, Tap etc.)
- **Boeing Mechanical Maintenance** - responsible for the daily mechanical and phase maintenance of the Boeing aircraft.

- **Boeing Avionic Maintenance** - responsible for the daily maintenance of Avionics systems on the Boeing aircraft.
- **Airbus Mechanical Maintenance** - responsible for the daily mechanical and phase maintenance of Airbus aircraft.
- **Airbus Avionic Maintenance** - responsible for the daily maintenance of Avionics systems on the Airbus aircraft.
- **Interior Section** - responsible for the maintenance of the cabin and passenger entertainment systems where fitted.
- **Historic Flight** - responsible for all the major, daily and phase maintenance on the Historic fleet such as the Dakota, Harvard, Junkers and DC 4 aircraft .
- **Avionic Modifications Majors** - responsible for the Avionics maintenance whilst an aircraft is in the hanger for a major check. (This department does not fall under major maintenance as there is no Avionics superintendent in majors and report directly to the superintendent Airbus Avionics maintenance).

All of the above departments had a geographically removed central data capturing point which was situated approximately 500 metres from the actual work area. Due to a lack of implementation of systems, methods and control, the time sheets were never arriving consistently at the capturing point thus leading to the huge labour hour omissions for this area.

The missing hour percentages for the cumulative aircraft group are depicted as follows:

Figure 4.4 Aircraft Group missing hour percentages Jan - Sept 1997



General comments:

As observed from figure 4.4, once the data capturers had been relocated during the middle of June into the two superintendent's offices, the cumulative average for all these departments was equal to the total average of all the other cost centres and continuing to be better than the average.

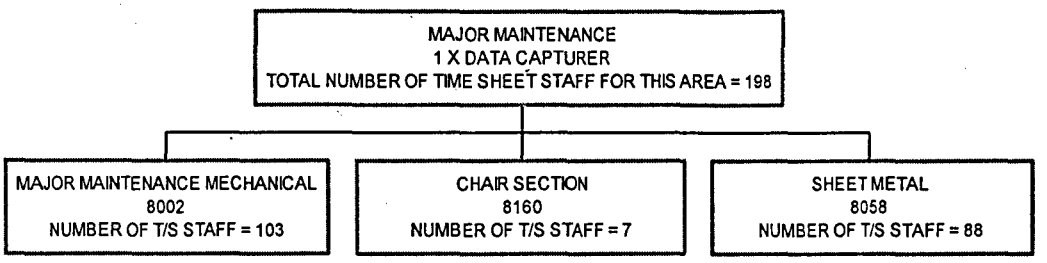
The following attributable factors contributed to the labour hour losses.

ineffective control	geographically dispersed capturing	lending	machines	apprentices	shift cycles	Programming
x	X	x		x	x	x

4.8.2 AIRCRAFT GROUP MAJOR MAINTENANCE FINDINGS

Aircraft group major maintenance, which is primarily responsible for the phased and time expired major checks consists of the following departments:

Figure 4.5 AIRCRAFT GROUP MAJOR MAINTENANCE STRUCTURE



- **Major maintenance mechanical**

  responsible for mechanical maintenance on aircraft requiring major checks.
- **Chair section**

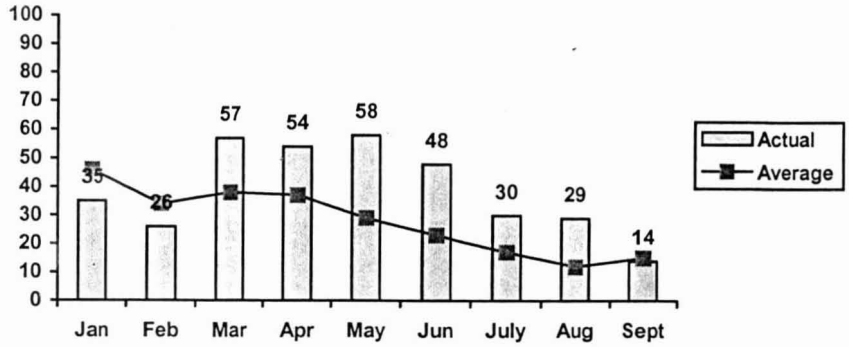
  responsible for the maintenance of the cabin and cockpit chairs as fitted to the aircraft. The bulk of this departments work is for major maintenance purposes.
- **Sheet metal or aircraft structures**

  responsible for the maintenance of the aircraft airframe and sheet metal requirements.

The following was observed for these three departments with each being dealt with on an individual as opposed to cumulative basis.

4.8.2.1 Aircraft group major maintenance

Figure 4.6 Aircraft group major maintenance Jan - Sept 1997



General comments:

Major maintenance had one data capturer, but due to the volume of work has necessitated employment of one extra assistant, this was indicted on the survey form results questions 7 & 8. With two data capturers the work load will be easier to handle.

Although there is evidence of a downward trend, this section requires close monitoring if it is excepted to exhibit further significant improvement. In trying to provide predictions, The following predictions for this department are made.

Using a mean average of 39.11 percent of hours missing, a standard deviation of 16.97 percent, and applying the standard normal probability distribution formula, the following is calculated. There is a 24.4% chance that the mean will rise to 50 percent hours missing, and a 28.3% chance of the mean dropping to 30 percent missing hours (ceteris peribus).

(For calculation see Addendum 4).

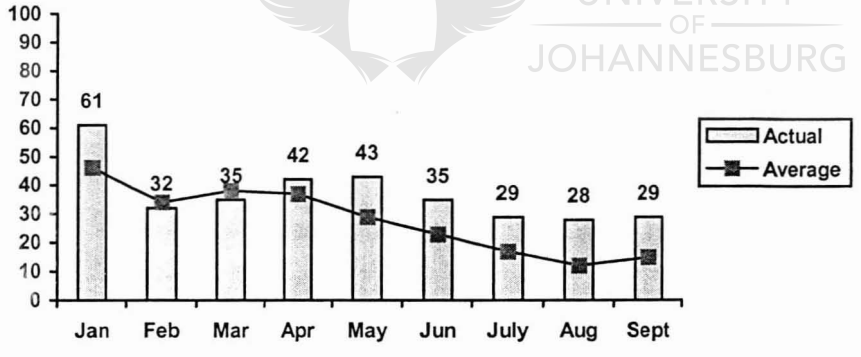
With this prediction, the movement appears to be in the correct direction but only fractionally. For all intents and purposes it will remain around the 39 percent mark.

The following attributable factors contributed to the labour hour losses.

Ineffective control	geographically dispersed capturing	lending	machines	apprentices	shift cycles	Programming
x		x		x	x	X

4.8.2.2 Major maintenance chair section

Figure 4.7 Major maintenance Chair section Jan - Sept 1997



General comments:

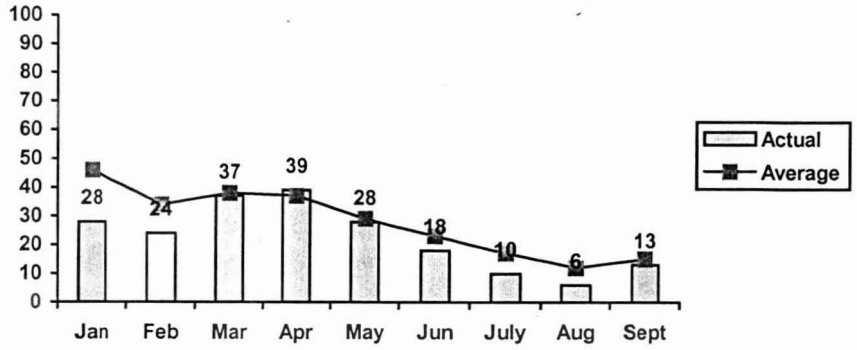
The same observations as for mechanical applies to chair section.

The following attributable factors contributed to the labour hour losses.

Ineffective control	geographically dispersed capturing	lending	machines	apprentices	shift cycles	programming
X		x		x	X	x

4.8.2.3 Major maintenance Sheet metal

Figure 4.8 Major maintenance, Sheet metal Jan - Sept 1997



General comments:

Sheet metal aircraft group exhibits lower labour hour omissions than the other two departments, indicating stricter commitment and control from a supervisory perspective. As all three departments use the same data capturer there is no reason for the chair and mechanical departments not providing similar trends.

The following attributable factors contributed to the labour hour losses.

Ineffective control	geographically dispersed capturing	Lending	machines	apprentices	shift cycles	programming
X		x		x	x	x

The support workshops and general findings follow.

4.8.3 SUPPORT WORKSHOPS FINDINGS

The support workshop's function is to service and overhaul components removed from the aircraft during the course of maintenance and may encompass any of the following types of disciplines; mechanical, electrical, composite, paint or Avionics servicing.

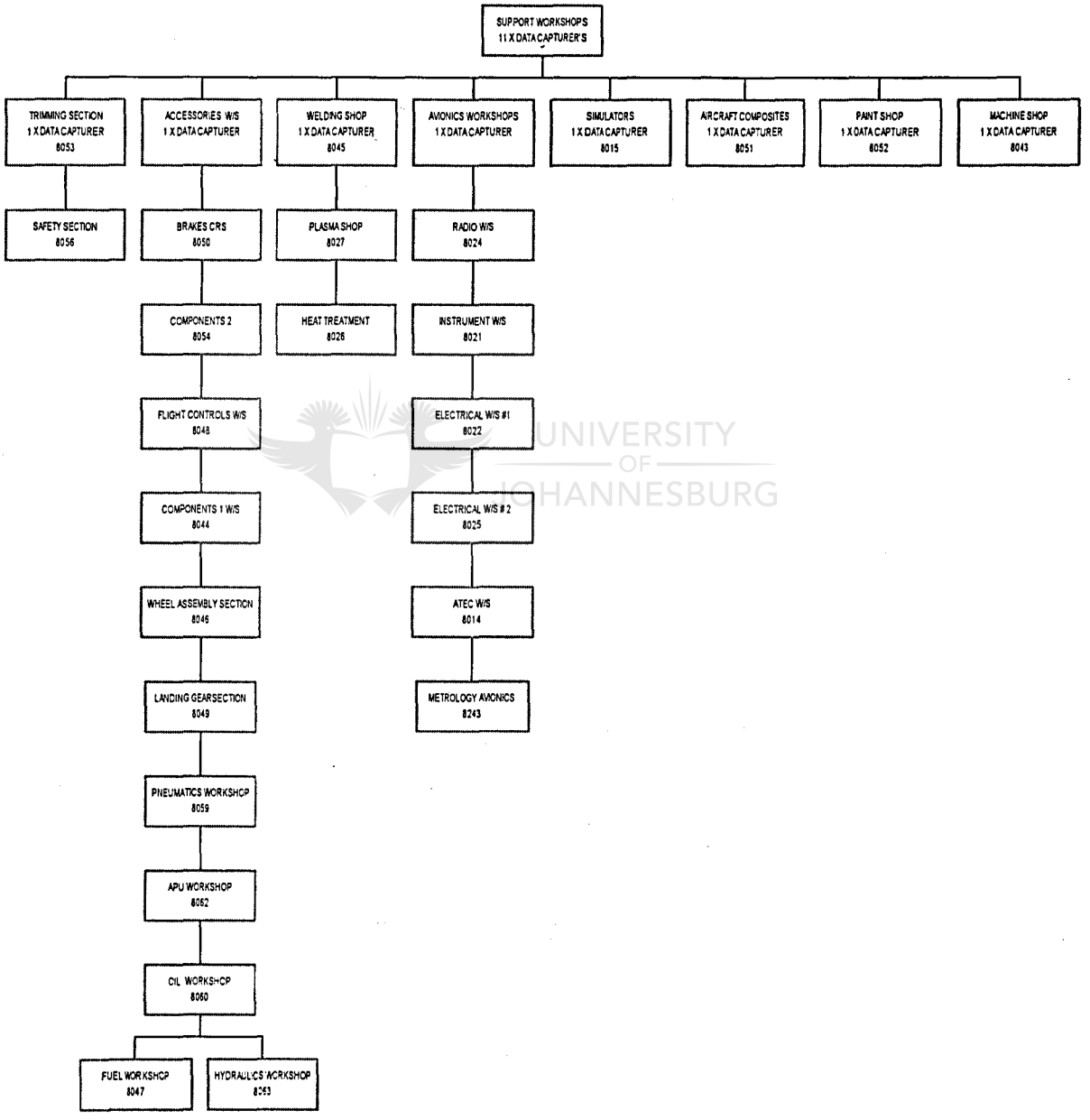
These components which are serviced or manufactured by the various support workshops are critical to the smooth and efficient operation of the airline and are produced in a quality, controlled and timeous manner. It should be noted that the support workshops' structure and capability is unique in South Africa as it entails autonomous servicing ability with few components being repaired by third parties, either locally or overseas.

This capital and labour intensive operation was established due to the rising need for self sufficiency, political pressures being applied over the years and, of secondary importance, the geographical location of the country. The geographical perspective is the only remaining item still valid today.

As indicated by the organogram following, there are a total of eleven data capturer's for the support workshop's area which is indicated in figures 4.9 and 4.18.

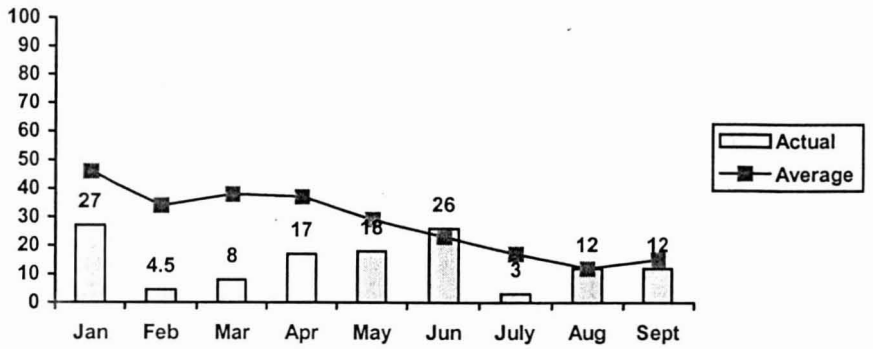
The support workshops will be analysed per data capturer of which as indicated, the total is eleven.

Figure 4.9 SUPPORT WORKSHOP'S STRUCTURE



4.8.3.1 Trimming and safety section

Figure 4.10 Trimming and safety section Jan - Sept 1997



General comments:

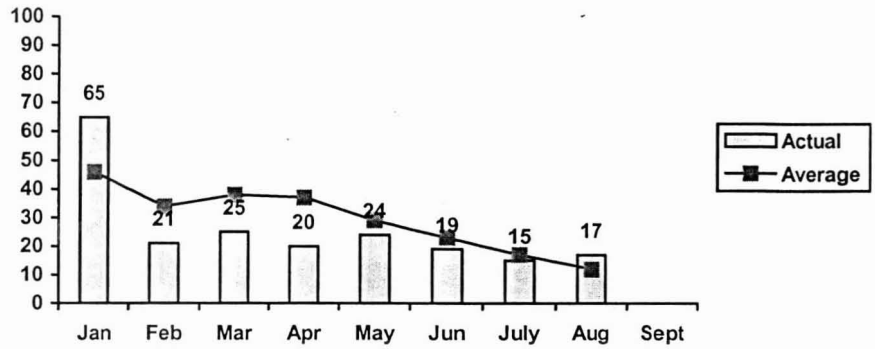
Appears under control, with solid lead sheet and control systems in place as indicated by the audit and response in question 8 of the survey form.

The following attributable factors contributed to the labour hour losses.

Ineffective control	geographically dispersed capturing	lending	machines	apprentices	shift cycles	programming
				x		x

4.8.3.2 Accessories workshops

Figure 4.11 Accessories workshop's Jan - Sept 1997



General comments:

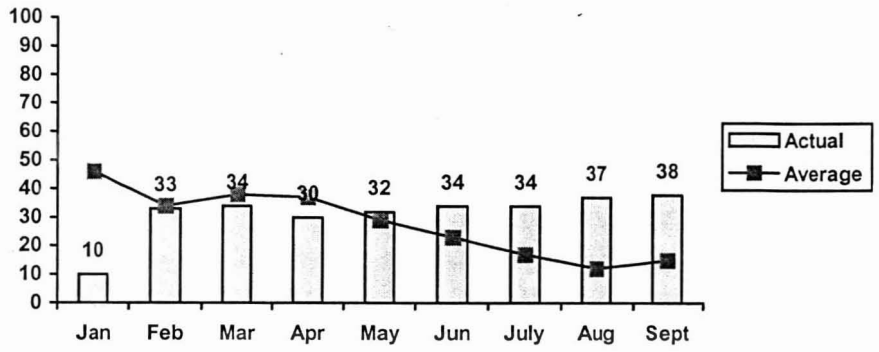
Subjected to lending between sections and machine utilisation anomalies.

The following attributable factors contributed to the labour hour losses.

Ineffective control	geographically dispersed capturing	lending	machines	apprentices	shift cycles	programming
		x		x		x

4.8.3.3 Welding shop, heat treatment and plasma workshops

Figure 4.12 Welding shop, heat treatment and plasma workshops Jan - Sept 1997



General comments:

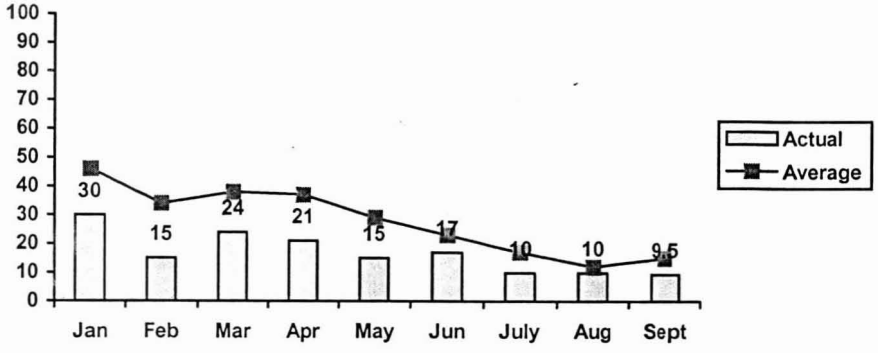
Although this area tends to indicate problems, the poor average is mainly due to the lending of personnel that occurs between departments and only once this problem has been rectified will improved figures be exhibited.

The following attributable factors contributed to the labour hour losses.

Ineffective control	geographically dispersed capturing	lending	machines	Apprentices	shift cycles	programming
		x		X		x

4.8.3.4 Avionics workshops

Figure 4.13 Avionics workshop's Jan-Sept 1997



General comments:

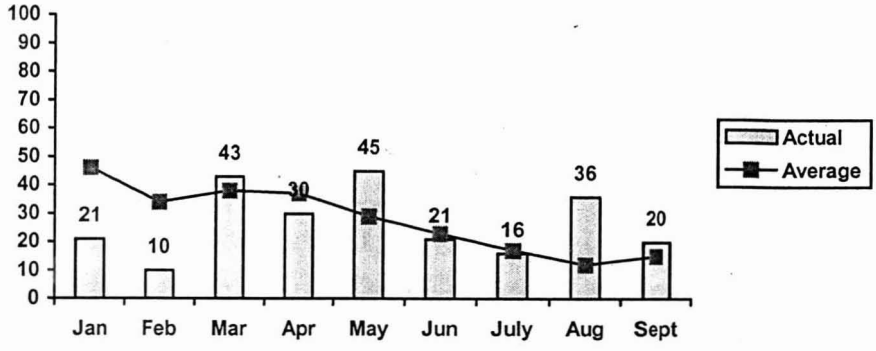
Indicates better than average figures due to an in-house developed labour reporting system, substantiated by response in question 8 of the survey form. This in-house system will be superseded when Empc is operational.

The following attributable factors contributed to the labour hour losses.

Ineffective control	geographically dispersed capturing	lending	machines	apprentices	shift cycles	programming
				x		x

4.8.3.5 Paint shop

Figure 4.14 Paint shop Jan-Sept 1997



General comments:

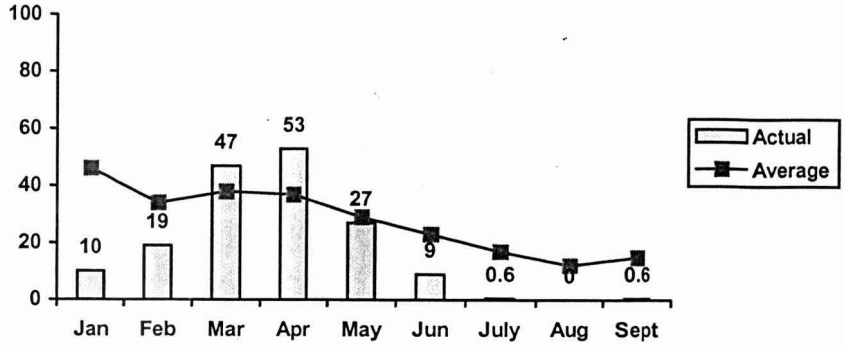
Should require further monitoring as it is generally worse than average.

The following attributable factors contributed to the labour hour losses.

Ineffective control	geographically dispersed capturing	lending	machines	apprentices	shift cycles	programming
X				x		x

4.8.3.6 Aircraft composite workshop

Figure 4.15 Aircraft composite workshop Jan-Sept 1997



General comments:

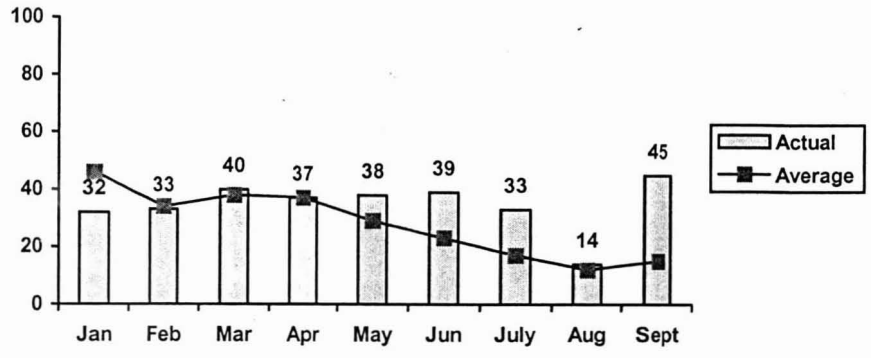
Nil, better than average performance.

The following attributable factors contributed to the labour hour losses.

Ineffective control	geographically dispersed capturing	lending	machines	apprentices	shift cycles	programming
				x		x

4.8.3.7 Machine shop

Figure 4.16 Machine shop Jan-Sept 1997



General comments:

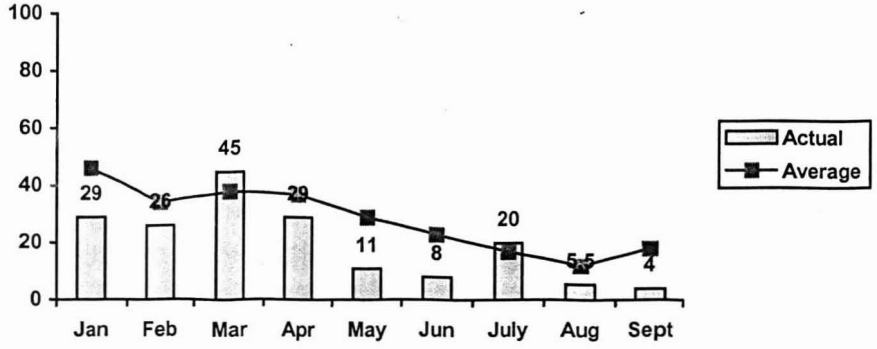
This department continues to exhibit worse than average omissions which is mainly attributable to the large number of machines on the departments strength. In August all machines except three were removed in an effort to eliminate the problem however, this action was identified as being incorrect and the transaction reversed which placed all the machines back on labour reporting. This action lead to the full months allocation of hours being assigned midway through the month thus creating the 45% under recovery. The staff reporting aspect is accurate.

The following attributable factors contributed to the labour hour losses.

Ineffective control	geographically dispersed capturing	lending	machines	apprentices	shift cycles	programming
			x	x		x

4.8.3.8 Simulator section

Figure 4.17 Simulator section Jan-Sept 1997



General comments:

No reason for concern.

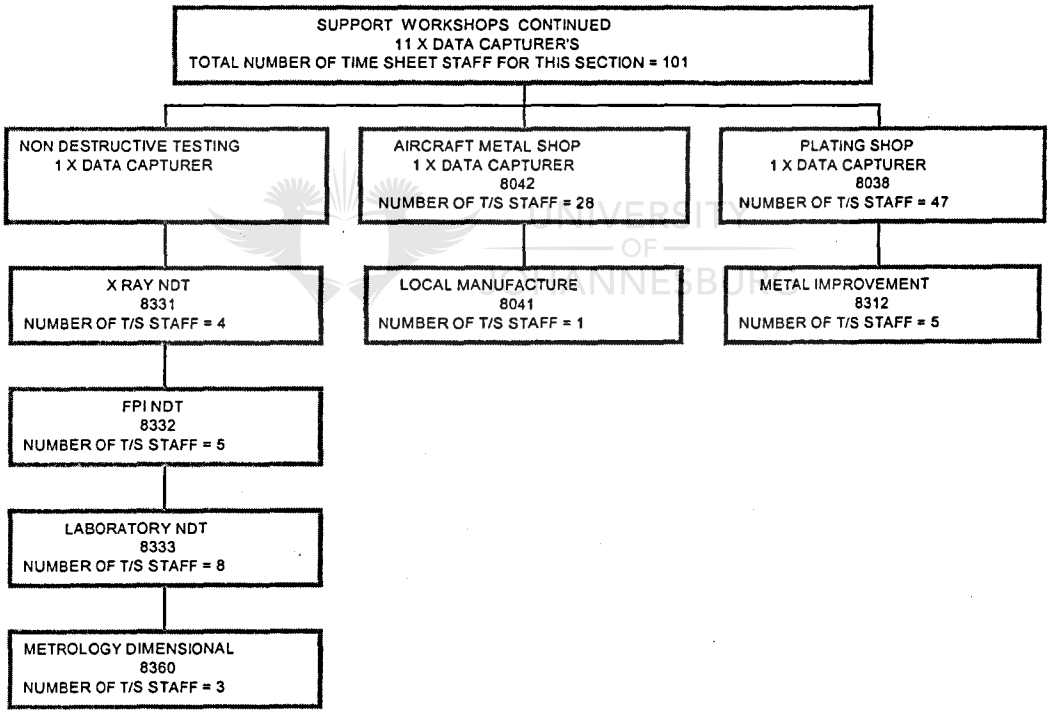
The following attributable factors contributed to the labour hour losses.

Ineffective control	geographically dispersed capturing	lending	machines	apprentices	shift cycles	programming
				x		x

The support workshop structure analysis continues and is illustrated further in figure 4.18 below.

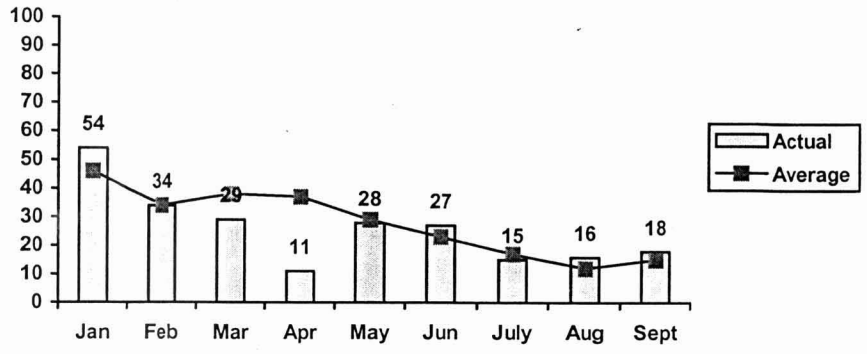
This organogram interrelates to figure 4.9

Figure 4.18 SUPPORT WORKSHOP'S STRUCTURE



4.8.3.9 NDT (Non destructive testing)

Figure 4.19 NDT (Non destructive testing) Jan-Sept 1997



General comments:

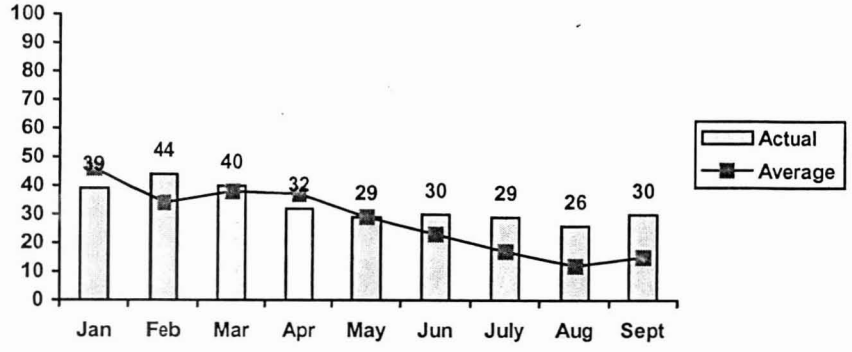
Subjected to lending of personnel between sections, but not excessively. Again this situation will only improve once the lending problem is rectified.

The following attributable factors contributed to the labour hour losses.

Ineffective control	geographically dispersed capturing	Lending	machines	apprentices	shift cycles	programming
		x		x		x

4.8.3.10 Plating shop

Figure 4.20 Plating shop Jan-Sept 1997



General comments:

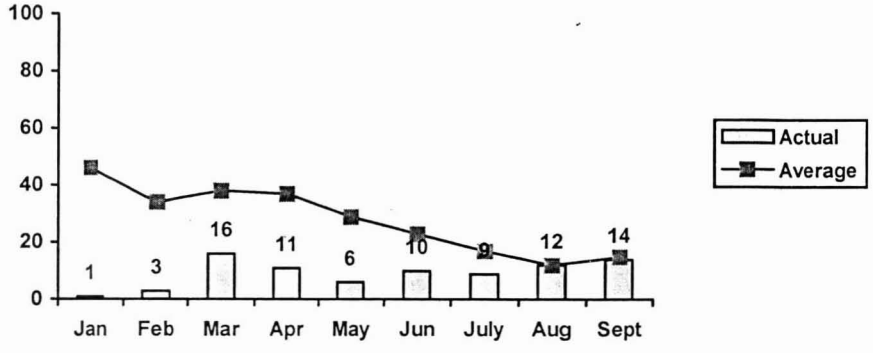
The machine allocation and utilisation is not correct indicating worse than average omissions. Either the number of machines should be reduced or productivity on the machines increased. The personnel aspect and accuracy level is acceptable.

The following attributable factors contributed to the labour hour losses.

ineffective control	geographically dispersed capturing	lending	machines	apprentices	shift cycles	programming
			x	x		x

4.8.3.11 Aircraft sheet metal shop

Figure 4.21 Aircraft sheet metal shop Jan-Sept 1997



General comments:

Nil appears acceptable.

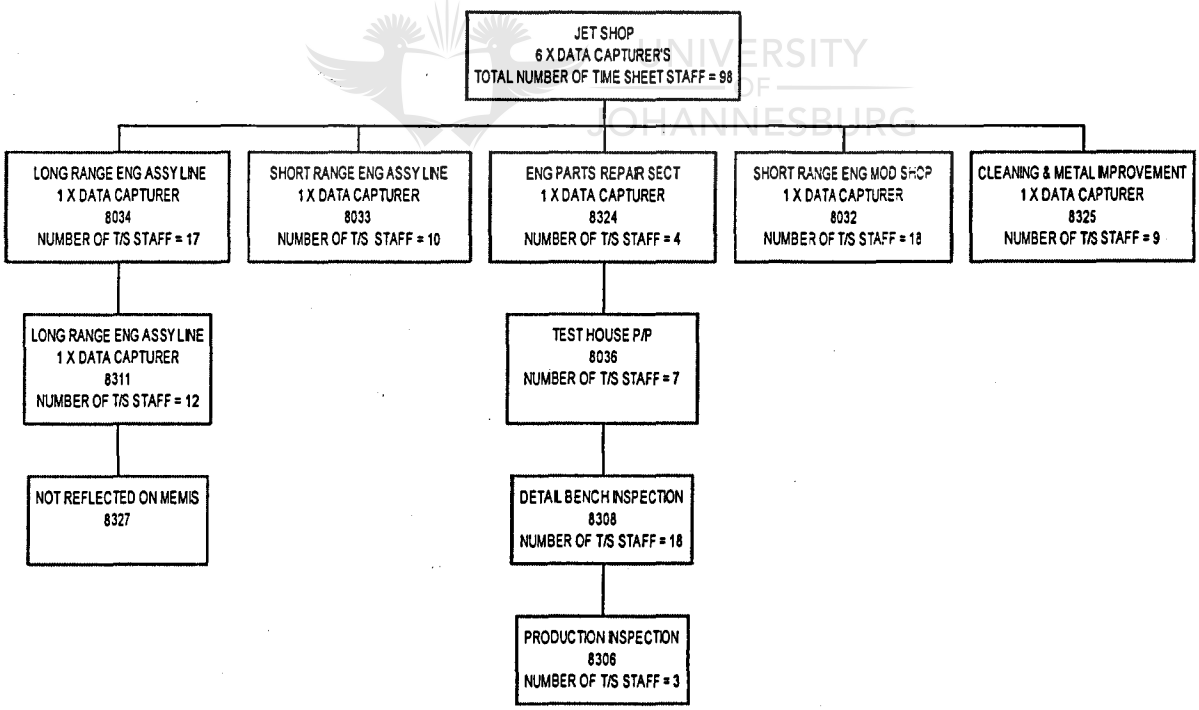
The following attributable factors contributed to the labour hour losses.

ineffective control	geographically dispersed capturing	lending	machines	apprentices	shift cycles	programming
		x		x		x

4.8.4 JET SHOP FINDINGS

Jet shop is responsible for the overhaul of all jet engines fitted to the SAA fleet and other airlines or operators require assistance and overhaul. It basically consists of a long range, short range, various support departments and an engine test cell of which there are 98 time sheet staff reporting on labour hours. The structure is illustrated in the organogram below in figure 4.22

Figure 4.22 JET SHOP STRUCTURE



Jet shop has been performing third party work much longer than most other departments and has over the years developed a feel and experience in deriving accurate quotes, but this was not without learning and growing experiences.

Initially jet shop relied on the SAP and Memis systems for the information required to prepare quotes, but due to inaccuracies and missing information misquoted on a number of jobs which resulted in unforeseen cost to the company.

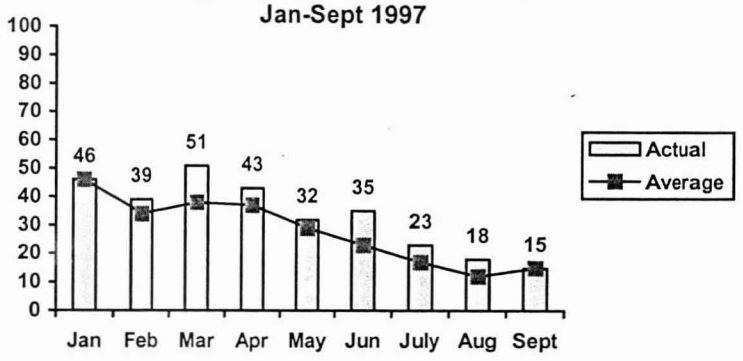
This experience resulted in jet shop having to maintain a separate and individual in-house set of historical and catalogue prices. The major contentious items identified were; labour hour rates, number of man hours to perform a job, the reliability of reflected bin quantities and the current material prices as reflected by Memis and Impact. As indicated previously it is imperative that these aspects are accurate to ensure derivation of meaningful quotes.

With the impending implementation of Empc time will tell if the new system will be able to provide jet shop with required accurate information but as it currently stands, it is evident that the confidence is low in the accuracy of the information provided by the present system. It should be noted that two departments within jet shop advocate the introduction of bar scanning (see survey question 8 response).

The following cost centres did not respond to the survey, 8036 and 8342, with the under recoveries being 17% and 1% respectively for these two departments. This lack of data will not influence the outcome or investigation as similar rules govern all departments within jet shop, and any changes suggested or implemented will be applicable to all departments.

4.8.4.1 Long range engine assembly line and long range engine module shop

Figure 4.23 long range engine assembly line and long range engine module shop Jan-Sept 1997



General comments:

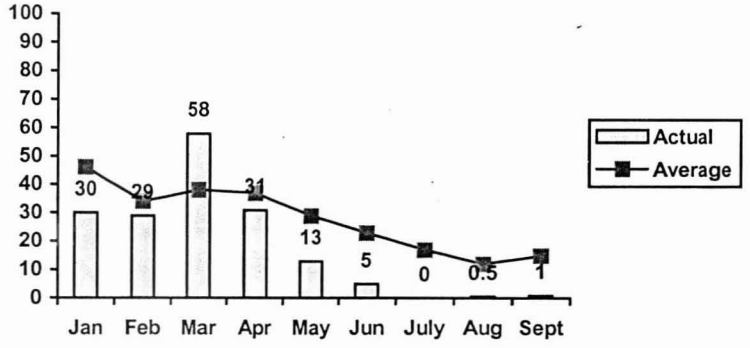
Nil, appears acceptable.

The following attributable factors contributed to the labour hour losses.

Ineffective control	geographically dispersed capturing	lending	machines	Apprentices	shift cycles	programming
		x		X		x

4.8.4.2 Cleaning and metal improvement

Figure 4.24 cleaning and metal improvement Jan-Sept 1997



General comments:

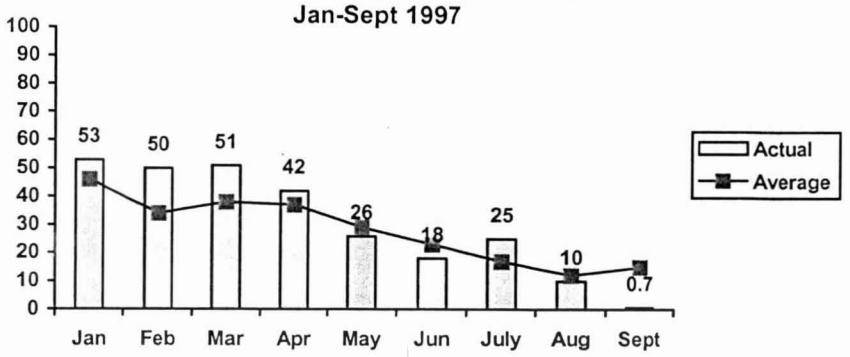
Nil appears acceptable.

The following attributable factors contributed to the labour hour losses.

Ineffective control	geographically dispersed capturing	lending	machines	Apprentices	shift cycles	programming
		x		X		x

4.8.4.3 Engine parts repair section, test house, detail bench inspection and production inspection

Figure 4.25 Engine parts repair section, test house, detail bench inspection, production inspection Jan-Sept 1997



General comments:

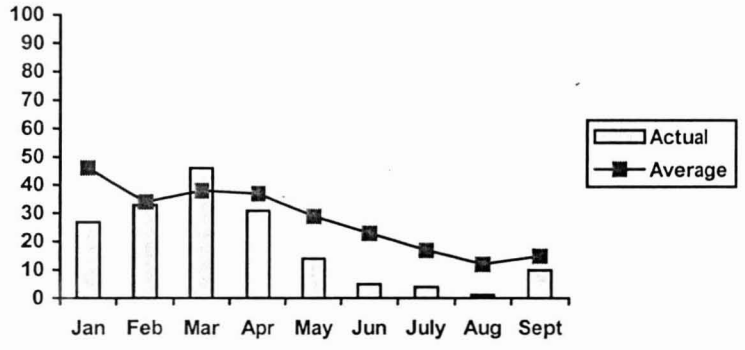
Nil appears acceptable.

The following attributable factors contributed to the labour hour losses.

Ineffective control	geographically dispersed capturing	lending	machines	Apprentices	shift cycles	Programming
		x		X		X

4.8.4.4 Short range engine module shop

Figure 4.26 Short range engine module shop Jan-Sept 1997

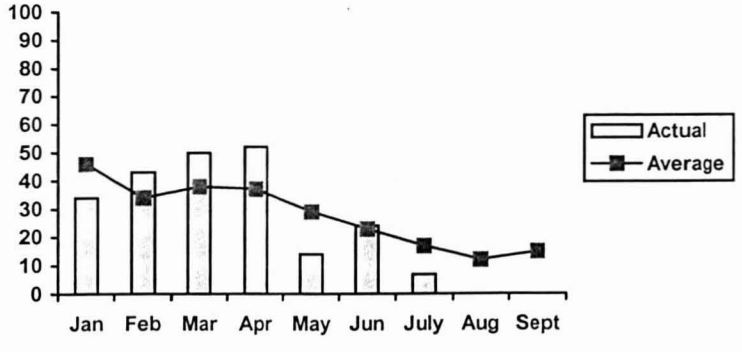


General comments:

Nil, appears acceptable.

4.8.4.5 Short range engine assembly line

Figure 4.27 short range engine assembly line Jan-Sept 1997



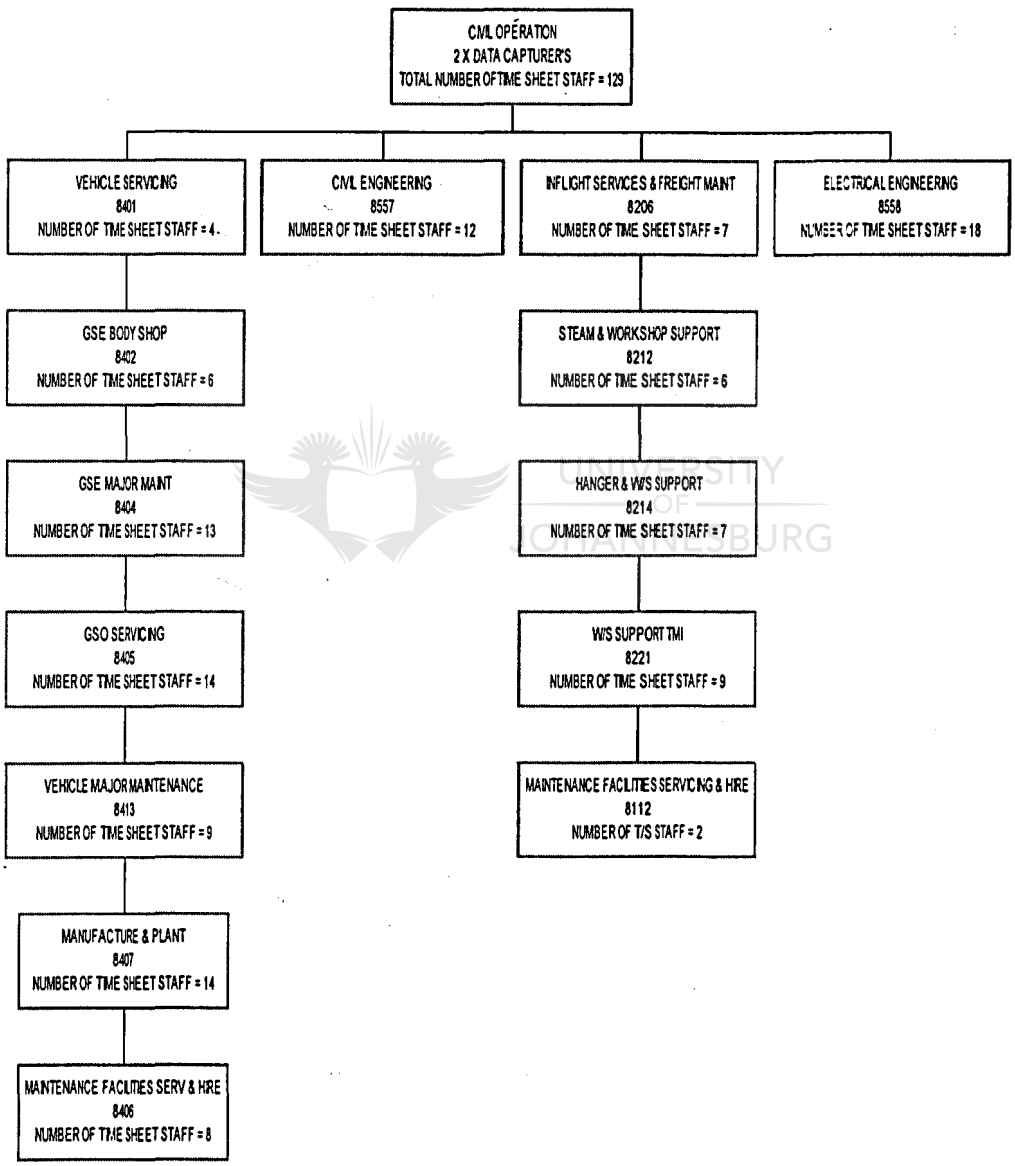
General comments for jet shop as a whole:

As can be seen from the above graphs, jet shop is not particularly problematic with regard to labour hour omissions but will show further improvement when the lending of personnel is sorted out.

4.8.5 CIVIL OPERATION'S FINDINGS

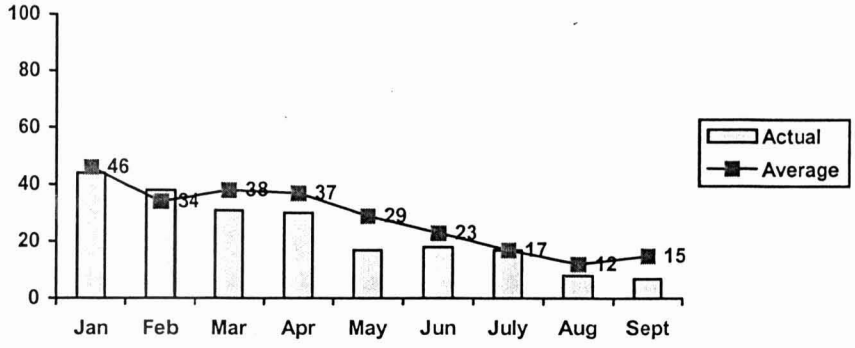
Civil operation's function is the overhaul and maintenance of buildings either electrically or structurally, the maintenance of vehicles, ground support equipment, buses, hanger equipment and generally non related aircraft equipment. It has a time sheet staff complement of 129 and has two data capturer's. The structure is as reflected in figure 4.28.

Figure 4.28 CIVIL OPERATION'S STRUCTURE



4.8.5.1 Civil operation's total

Figure 4.29 Civil operation's total
Jan-Sept 1997



General comments:

This is another area that has geographically dispersed data capturing, but did not exhibit the same degree of omissions as the aircraft group. It also subjected to the lending of personnel between departments and will show improved figures once this problem is rectified.

The following attributable factors contributed to the labour hour losses.

Ineffective control	geographically dispersed capturing	lending	Machines	apprentices	shift cycles	Programming
		x		x	x	X

4.9 CONCLUSION

It may be concluded in this chapter that geographically dispersed data capturing was the primary reason for labour hour losses within the aircraft group. In the remaining areas, various contributing factors such as incorrect assignments and reporting were the causes.

CHAPTER FIVE
CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSION

In chapter two under the literature review, it was brought to the reader's attention that SAA Technical utilises a complex activity based costing system which is used to provide the financial management reporting and controlling aspect of the operation (cf. 1.1, cf. 2.4.2). In meeting this objective, personnel, systems, methods and different brands of computer hardware and software interact to ensure a complex but smooth operation (cf. 2.6).

In maintaining and ensuring the efficiency of the operation, it is vital that the components and measures whether they be the reliability of the hardware and software or integrity of the manual time sheet capturing, are as precise and accurate as humanly possible (cf. 1.1).

SAA Technical, on an ongoing basis, continues to evolve and develop latest ideas and concepts, with the latest one being the introduction of a bar scanning to replace manual time sheets (cf. 2.7.3). Bar scanning, which is scheduled to replace manual time sheets in most areas, is an automated labour reporting capturing system intended to eliminate the problems associated with the manual reporting system but, as indicated in chapter one, some departments will continue to utilise the manual reporting system and therefor, the continued accuracy of time sheet capturing in affected areas must continue to be ensured.

This research which was primarily focused on the reasons as to why the manual time sheet system and subsequent capturing was performing so poorly provided at the culmination of this study, indirect additional benefits pertaining to the bar scanning system. This benefit was in the

form of improved accuracy of the computer transfer program, the results of which are expounded on further in this chapter (cf. 5.5).

During the research with the aid of the survey responses, available secondary data, predictions and analysis, it became apparent that three major reasons existed for labour hour under recoveries, these three reasons were:

- ineffective operational control methods.
- geographically dispersed data capturing.
- computer transfer routine programming errors.

The following conclusions and recommendations may thus be made with regard to the research project:

5.2 PRIMARY FINDING AND RECOMMENDATION

- As indicated in chapter four, lack of systems and methods control were the primary cause of labour hour omissions, with the aircraft group being singled out as the worst affected area. However, after implementation of localised data capturing (accomplished by the movement of the data capturers to the Superintendents offices) and the subsequent improved control arising therefrom, the data to substantiate this claim now exhibits general as well as individual improvements (cf. 4.3). Realistically though, if the same attitudes methods and systems continue to be used, the average omission can not be expected to attain a level below 10% and if management is serious about reducing the figure lower than 10%, then closer monitoring and tighter control in each department will have to exercised.

If a reason exists as to what at this stage could cause the current improvements to regress, then dual accountability of work i.e. bar scanning capturing combined with manual time sheet recording must be singled out.

Reconciliation of hours within major maintenance is becoming problematic for some supervisory personnel to deal with. In attempts to alleviate the problem, the affected supervisors are resorting to assigning technicians either to bar scanning work or manual time sheet but not to a combination of both. As this method is impractical and contrary to practice, close monitoring of the situation within the affected areas will have to be undertaken to ensure that accountability remains accurate. Failure to do so could result in a loss of confidence in the system by the personnel concerned and, further degradation of the labour reporting. Therefore, it is strongly recommended that all efforts to implement smooth and trouble free integration of the bar scanning must be ensured.

5.3 MEMIS RELATED RECOMMENDATIONS

5.3.1 LBR001 Report

- The Memis LBR001 report as indicated in chapter four can be misleading however, as suggested by the IS department, the reports are now beginning to appear in a spread sheet A4 type format and initial indications and comments are that this document is now more acceptable to the large majority of users. This improvement will reduce a lot of negative criticisms and perceptions relating to labour reporting (Addendum 3).

5.3.2 Lending of personnel

- The assigning of hours when time sheet staff perform work between various cost centres and, the allocation of apprentices to the various departments on a short term basis, is still an outstanding item but, a software update from Alitalia has been received and beta testing should commence shortly. Once implementation of this software occurs the fix should have a positive effect on the labour hour omissions in affected areas.

5.3.3 Memis cut off date for data entry

- The inability of the Memis program to limit the entry of labour hours for a previous month after a cut off date has been reached, continues to be problematic. If this anomaly is not rectified, distortions, discrepancies and frustrations will continue to exist in the labour reporting system. Determining who actually entered the data after the cut off date is almost impossible to ascertain and therefore the only effective solution is to inhibit input after the cut off date has been reached (cf. 4.4).

5.3.4 Machine hour allocations

- Departments affected by having machines reflected on the labour report should rather have the monthly budgeted hours for the machines as the reference as opposed to the current man hour per month allocation. This would be a more realistic approach to allocation of machine hours (cf. 4.2, 4.10.7).

5.3.5 Contract workers

- At this stage, contract workers are being treated within the company as an overhead and reflected on the income statement as such. A more realistic way to address the problem would be to assign them a pension number and treat them as a direct labour component. This anomaly arose because of the incompatibility between Memis and SAP and will have to be corrected on the SAP computing side (cf. 4.5).

5.4 LEAD SHEETS

To further control and monitor the tracking of labour hours within a department it is suggested that lead sheets where utilised be slightly modified to include a blank column for the purpose of stamping a 'data captured' field. This field would only be stamped by the data capturer once the data is entered into Memis.

If a full 8 hours is not accounted for by the technician then the field should be left blank until such time as the supervisor or technician concerned provides the missing information by way of a time sheet. In this manner stricter control in the handling and administering of time sheets will be ensured and should lead to tighter tracking on behalf of the capturers.

5.5 BENEFITS FROM RESEARCH PROVIDED TO BAR SCANNING

It will be recalled from chapter one where it was stated that the research would possibly provide benefits to the bar coding system well, research indicated that a programming error did indeed exist in the computer transfer program and that without the research having occurred, this problem would possibly not have been identified. The additional

accuracy provided by rectifying this unforeseen problem is without doubt advantageous (cf. 4.4).

5.6 CONCLUSION

It may thus be concluded that the research was beneficial, important and enlightening to SAA Technical's operation and, at the end of the day provided accurate reasons for the under recoveries.

If the recommendations as presented are adhered to, there is no reason for the present situation not continuing to maintain or exhibit further improvements.

5.7 CRITIQUE

If time had allowed it, then further research into the effectivity and efficiency of bar scanning would have been beneficial as initial indications are that manipulation of the system is occurring. However, that aspect is beyond the scope of this investigation and the study as applied will undoubtedly contribute in the long term to more effective operational and bottom line improvement.

This study taught the researcher a lot about patience, perseverance and interpersonal skills and in a lot of occasions reinforced initial feelings and doubts. With the guidance of the supervisor Dr RWE Van Der Wal, improved self-esteem, ability and confidence in applying business research methods was gained.

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ABBREVIATIONS

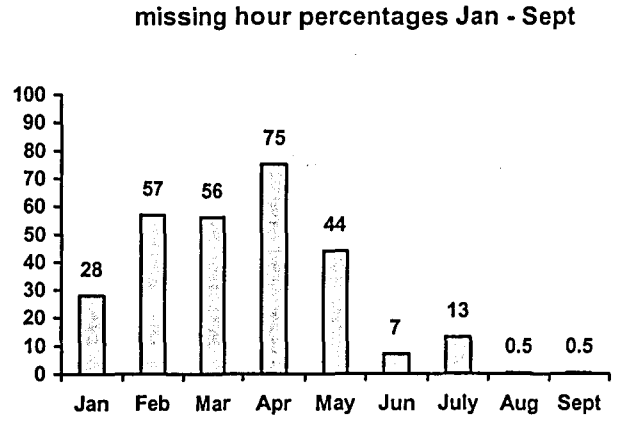
ABB:	Activity Based Budgeting.
ABC:	Activity Based Costing.
ABP:	Activity Based Planning.
AMOS	Aircraft Maintenance and Overhaul System
CEO	Chief Executive Officer
DATAM	Denel Aviation Transport Aircraft Maintenance
EMPC	Engine Maintenance Production Control
EXCEL	Spreadsheet
GSE	Ground Support Equipment
GSO	Ground Support Overhaul
IMPACT	Integrated Management Of Profit And Cost
IS	Information Systems.
KPA	Key Performance Area
LBR001	Memis monthly labour report
MEMIS	Computer system used for activity based costing.
NDT	Non Destructive Testing
P/P	Power plant
PDA	Production Data Actualisation
QPAC	Computer pay roll package
SAA	South African Airways.
SAP	Computer program (Systems applications and Programs).
SATS	South African Transport Systems
SECT	Section
SERV	Servicing

T/S	Time Sheet
W/S	Workshop

ADDENDUMS

Addendum 1 - Aircraft Group Daily Maintenance Findings

Area	Departures
cost centre number	8007
number of time sheet staff	49
June under recovery %	7%
reasons for under June under recovery (supt. Identified)	Operational control 1 x staff member when acting higher grade not completing time sheets 1 x non time sheet staff on time sheet list
Rectification	System updated
sample size	10
findings on sample	1 x sampled technician 52 hours missing 1 x sampled technician 6 hours missing
Recommendations	Nil at this stage



Addendum 2 - Survey Required From Data Capturers

To be completed by the time sheet clerk

With reference to the highlighted names please complete the following form

(This will involve some investigation)

Name:.....

Pension Number.....

1 - For the month of June 1997 tick the days that the above person submitted time sheets

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
18	19	20	21	22	23	24	25	26	27	28	29	30				

2 - Was this person during the month of June 1997

one leave:

Yes	no	don't know	number of days	N/A

sick:

Yes	no	don't know	number of days	N/A

attending course:

Yes	no	don't know	number of days	N/A

acting higher grade:

Yes	no	don't know	number of days	N/A

on relief:

Yes	no	don't know	number of days	N/A

flying technician:

Yes	no	don't know	number of days	N/A

Addendum 3 – Probability projection to determine whether the average number of hours missing for SAA Technical will drop below the 10 percent level.

With reference to figure 4.1 and using the standard probability formula $z = \frac{x-\mu x}{sx}$

the following may be calculated:

n ; number of samples = 9

Month	% missing hours	μx (mean)	Deviation	Squared deviation
Jan	46	27.88	18.12	328.33
Feb	34	27.88	6.12	37.45
March	38	27.88	10.12	102.41
April	37	27.88	9.12	83.17
May	29	27.88	1.12	1.25
June	23	27.88	-4.88	23.81
July	17	27.88	-10.88	18.37
August	12	27.88	-15.88	252.17
September	15	27.88	-12.88	165.89
				1112.85

$s^2x = \frac{\text{sum of squared deviation}}{(n-1)}$

$s^2x = \frac{1112.85}{(9-1)}$

$= 139$

$sx = 11.79$ percent missing hours.

$Z = \frac{x-\mu x}{Sx}$

$= \frac{10-27.88}{11.79}$

$= 1.51$

from z tables

$= .3749 - 0.5$

$= 12{,}55\%$

Addendum 4 – To determine what the probability is for the Aircraft Group Mechanical Major Maintenance average missing hours currently at 42% either rising above 50% or dropping below 30%.

With reference to figure 4.6 and using the standard probability formula $z = \frac{x-\mu x}{sx}$

the following may be calculated:

n ; number of samples = 9

Month	% missing hours	μx (mean)	Deviation	Squared deviation
Jan	36	39.11	-3.11	9.67
Feb	26	39.11	-13.11	171.87
March	57	39.11	17.89	320.05
April	54	39.11	14.89	221.71
May	58	39.11	18.89	356.83
June	48	39.11	8.89	79.03
July	30	39.11	-9.11	82.99
August	29	39.11	-10.11	102.22
September	14	39.11	-25.11	630.51
				1974.88

$s^2x = \frac{\text{sum of squared deviation}}{(n-1)}$

$s^2x = \frac{1974.88}{(9-1)}$

$= 246.86$

sx = 15.71 percent missing hours.

$Z = \frac{x-\mu x}{Sx}$

$= \frac{50-39.11}{15.71}$

$= .6931$

from z tables

= .2560 – 0.5

= 24.4%

$$Z = \frac{x-\mu x}{Sx}$$

$$= \frac{30-39.11}{15.71}$$

= .5798

from z tables

= .2170 – 0.5

= 28.3%