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Forestry Solutions

A TASK ANALYSIS OF MECHANICAL TREE HARVESTING TO IDENTIFY THE APTITUDES NECESSARY TO SUCCESSFULLY DO THE JOB

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Executive Summary

There is an increasing reliance on mechanised harvesting in New Zealand forestry. With the technology comes increasingly complex machine functions and the need to identify and select the best person to operate the machine. A job analysis was conducted on the mechanised harvester operator's position in order to identify the competencies necessary to make a successful operator.

The report begins by outlining the purpose of job analysis and the potential use of the information obtained through the process. The Position Analysis Questionnaire was combined with a more generalised structured job analysis interview containing elements of the Critical Incidents Technique in order to analyse the position. A total of eleven operators were utilised in the analysis as were a number of direct and indirect observation sessions.

The analyses indicate four key result areas and eight critical competencies. The key result areas are: Producing the required amount of logs to the specified standard, fixing and maintaining the machine, working with the logging crew and maintaining the safety of self and others.

The competencies that were identified as being critical to success as a mechanised harvester operator were;

1. Log making knowledge and ability
2. Mechanical ability
3. Computer knowledge
4. Positioning machine and logs
5. Drive machine base
6. Awareness of safety
7. Personality characteristics
8. Team participation

A number of test predictions were derived from the position analysis questionnaire as was an analysis of the 45 job dimensions as outlined by the PAQ. Attribute ratings of an interest or temperament nature and attribute ratings of an aptitude nature are also discussed.

The position analysis questionnaire was also used to compare the harvesting task on a normative basis with other positions in the New Zealand PAQ database. Jobs were compared in terms of job evaluation points and job prestige scores. An objective evaluation of the stress associated with the harvesting task was also conducted.

Contents

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Introduction

The benefits associated with mechanised approaches to harvesting include a decrease in accident rates, increased productivity, an improvement in the quality of output and increasingly minimised site damage (Byers 1995). These factors have led to an increased reliance on machine usage in harvesting operations. The large financial investments that are associated with modern harvesting equipment (NZ$500,000 to $2,000,000) and the central role such equipment plays in harvesting operations means that they must be operated by a skilled operator. In fact competent machine operators are crucial to the overall efficiency and economic viability of harvesting and contracted operations (Kirk, Byers, Parker & Sullman 1997).

To identify the exact competencies and skills that are required for the optimum integration of modern harvesting equipment into forestry, a detailed, structured analysis of the positions under consideration is needed. In order to obtain insight into the competency and skill set needed to successfully operate harvesting equipment, a carefully designed, standardised assessment procedure is also required. Once the aptitudes and qualities of successful operators have been identified, a selection procedure can be designed in which operators with these characteristics can be readily identified.

The objective of this research was to conduct a task and job analysis of mechanical tree harvesting to identify the aptitudes necessary to successfully operate the machinery. What follows is a detailed description of the job analysis procedures employed in the research, the outcomes of the analysis and the subsequent identification of the skills, aptitudes and competencies of successful operators.

Job Analysis

The lack of appreciation shown towards human factors considerations in forestry has been well documented in this country (Kirk, Byers, Parker & Sullman 1997) and overseas (Garland 1986). A recent review of the mechanisation literature published in New Zealand found that only one publication out of the 156 published articles focused on human factors aspects of mechanisation (McConchie & Evanson 1996). Although large advances have been made in the areas of ergonomics, safety, human potential such as fatigue and occupational overuse syndrome and the general 'fitting the task to the man', the 'fitting the man to the task' side of the process has been largely overlooked. More specifically, research in the areas of organisational psychology such as job analysis, performance assessment, selection, recruitment and training have been largely non existent in not only this country but also overseas.

The importance of job analysis to all areas of human resource activity cannot be understated. The general purpose of a job analysis is to enable us to break down a job into its components or discrete parts (Landy 1989). In other words the analysis helps us determine and identify the different aspects involved in the completion of a particular job. The information obtained from job analysis can be used for a number of purposes and it is only through the process of job analysis that specific organisational initiatives and improvements can be made (Pearn & Kandola 1995). More specifically, job analysis provide us with systematic detailed information about a position, which can then be used for a variety of different organisational purposes. McCormick (1979) has summarised these in the following way:-

Uses by employing organisations

- Personnel recruitment

- Personnel selection and placement
- Personnel evaluation
- Job design
- Training and personnel development
- Personnel utilisation
- Establishment of lines of responsibility
- Establishment of organisational relationships
- Union relationships (contract negotiations, grievances, etc.)

Uses by government agencies

- Occupational standards, licensing, certification, etc.
- Equal employment opportunity matters
- Public employment service
- Public training and education programs
- Social security matters including unemployment compensation
- Working conditions, safety, etc.

Uses by individuals

- Vocational selection
- Vocational preparation

Uses for research

- Personnel and other behavioural research
- Sociological research
- Demographic (i.e., population) research
- Economic research

Four of the major uses of such information are shown in Figure 1. Job Analysis provides us with the information on which job evaluation or remuneration rates are based and the criterion upon which performance assessment measures are determined, and the competencies that need to be assessed throughout the course of a selection process. It is also used for the development of job descriptions that are in turn utilised in the recruitment process.

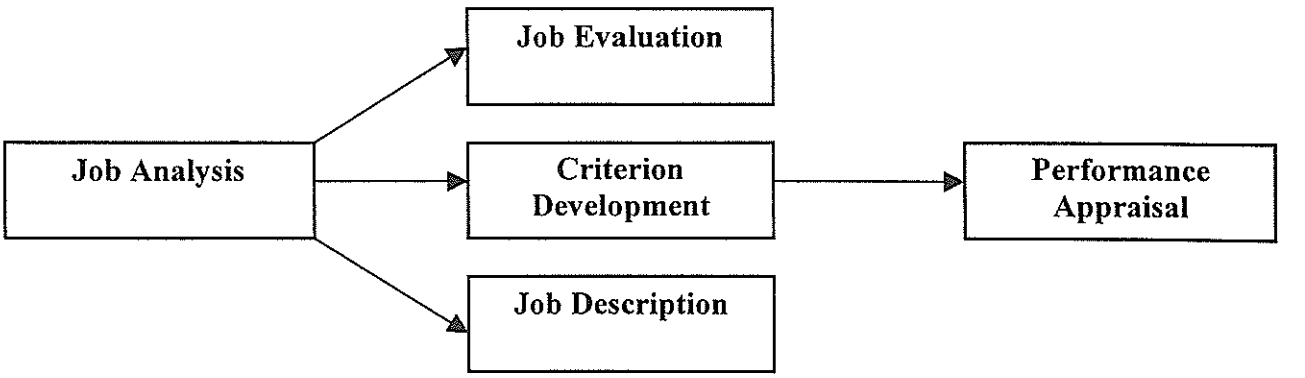

Figure 1, Four of the major uses of the information obtained from job analysis (Landy 1989).
methodology employed, job analysis involves some combination of interviews, questionnaires,

checklists, observations and work participation. The different methodologies can be separated into three different categories. These being task-based, attribute-based and behaviour-based analysis, depending on their specific focus (Table 1).

Task Based	Attribute Based	Behaviour-based
Functional Job Analysis	Functional Job Analysis	Critical Incident Technique
Department of Labour task analysis	Position Analysis Questionnaire, job element method	Position Analysis Questionnaire
Task inventory, comprehensive occupational data analysis programs	Ability requirements scales	Functional Job Analysis

Table 1. Major Methods of Job Analysis (Fine 1986)

Early requests for improved organisational practices within forestry in the form of job analysis were made by Wilson (1978). More recently, Garland (1986) has made numerous suggestions and recommendations regarding improving organisational practices amongst the forestry industry in Central America. In New Zealand, Cummins (1998a), Sullman and Evanson (1998), Byers (1995), and Kirk, Byers, Parker and Sullman (1997) have outlined the need to embrace more effective and informed approaches to the organisational areas of training, selection and performance assessment.

Standardised training procedures within forestry in general and mechanised harvesting operations in particular have also been recommended. The financial benefits associated with machine operator training have been indicated by Sullman and Evanson (1998) who reported results from a Scottish study in which a saving of $46,843NZ was made through the use of a training program. This saving was accounted for by an increased speed of attaining maximum output. Other benefits associated with training programs include less machine and site damage, better operator performance and well being and less machine down-time (Garland 1986).

Similar benefits are associated with the utilisation of standardised, validated selection methods (Landy 1989). Currently, operator selection in New Zealand involves a high degree of trial and error, with operators being trialed on machines in a haphazard manner. Factors such as a slow learning curve, machine breakdowns and subsequent down-time, and the loss of operational productivity that could have been occurring if a more suitable individual was selected for the position mean that better selection methods are needed. The costs associated with a machine operator failing to become a successful operator are potentially huge.

Past research has also shown that more competent performers are more likely to maintain lower rates of injury (Sluss 1992). Turnover rates could also be expected to drop as more suitable individuals are selected for the machines. If formal training programs similar to those in Australia and Europe are established, individuals most likely to succeed or benefit from the training in a crew or gang could also be identified and selected.

Improvements in these areas will lead to increased productivity, improved harvesting techniques, improved safety standards, a better more qualified work-force, and even improved perceptions of forestry by those outside of the industry. Before any of these can be achieved however, standardised job analysis methodologies need to be employed and applied to the various positions within the forestry industry. As such, the objective of the current research was to identify the aptitudes (skills,

traits, characteristics) needed to successfully operate mechanised harvesting machinery with the purpose of later developing a selection procedure for the position.

Method

Materials

The analysis of the mechanised harvesting position incorporated two well known job analysis methodologies. The Position Analysis Questionnaire (PAQ) (McCormick, Jeanneret & Mecham 1972), and a more generalised job analysis interview. The PAQ is a structured job analysis inventory that has been used to analyse a great variety of occupations (Pearn & Kandola 1995). The PAQ consists of 194 separate job elements, 187 of which relate to work activities and 7 to information on rates of pay. The elements are characterised as being of a 'worker oriented nature' in that they are based on the assumption that there is a definite set of dimensions-a taxonomy of aptitudes or characteristics that can be used to describe a job and explain the differences in worker performance (Fine 1986).

The job elements contained in the PAQ are organised into six separate dimension categories. The following is a description of the different categories and examples of some of the items contained in each category.

1 Information Input

This category refers to how and where the worker receives the information needed to perform the job and is further broken down into the subcategories of visual and non-visual sources of information and sensory and perceptual processes.

- Written materials e.g. books, reports, signs, notes.
- Materials in process
- Near visual acuity

2 Mental Processes

This section of the analysis assesses what reasoning, decision making, planning and information processing activities are found on the job.

- Reasoning in problem solving
- Analysing information or data
- Job related experience

3 Work Output

This section refers to the physical work activities included in a job and assesses the type and degree of tools and equipment that is used.

- Manually powered precision tools or instruments
- Activation controls
- Highly skilled body co-ordination

4 Relationships With Other People

Assesses the type of relationships and interpersonal contact that is required on the job.

- Routine information exchange
- Job required personal contact
- Total number of persons for whom responsible

5 Job Context

This section of the questionnaire examines the physical and social context within which the job is performed.

- Out of door environment
- Awkward or confining work-space
- Strained personal contacts

6 Other Job Characteristics

Assesses any other activities, conditions and job characteristics that are not covered in the previous categories.

- Licensing/certification required
- Repetitive activities
- Vigilance: Infrequent events

The PAQ requires ratings to be assigned to each job element. Six different types of rating scales are used in the questionnaire, each requiring a rating of between 0 and 5 or 0 and 1. The different scales that are used are in the analysis are:

- ***Extent of use***- This scale requires the analyst to determine to what extent the source of information described in the item is used in performing the job.

- ***Importance to the job***- The importance scale is the most frequently used rating scale in the PAQ. It requires the analyst to determine how important the activity or attribute specified by the item is to the performance of the job.

- ***Amount of time***- This scale requires the analyst to determine the approximate proportion of time the worker is exposed to the condition or engaged in a particular activity.

- ***Possibility of occurrence***- This scale assess the likelihood that certain types of injuries or illnesses may result from the job.

- ***Applicability***- The applicability scale allows for only two types of responses: Does not apply or Does apply.

- ***Special code-*** Used for only a few elements.

In addition to the PAQ, a further more generalised job analysis interview was utilised incorporating aspects of the critical incident technique (Flanagan 1954). This interview was a structured type of interview designed to elicit more descriptive information to complement the qualitative information obtained through the PAQ.

The Critical Incident Technique requires subject matter experts (people familiar with the position under investigation) to consider and describe what they believe to be the key dimensions or critical components of the position. They are then required to describe some specific scenarios in which they themselves have performed either poorly or well on each of the dimensions. These critical incidents can then be used to identify what distinguishes high performance from mediocre or poor performance (Bownas & Bernardin 1988).

The combination of the PAQ and the more general job analysis interview provided a comprehensive overview of the nature of the mechanised harvesting task. The methods complimented one another in that they each elicited different information and in the degree of quantitative and qualitative information obtained, the structure of the method, and in the sophistication, adaptability and packaging of the methodology (Pearn & Kandola 1995).

In addition to the aforementioned methodologies, the Wonderlic Personnel Test (WPT) (1998) was also utilised during the job analysis. The WPT is an intelligence test designed to assess an individuals problem solving ability. One of the outputs obtained from the PAQ provides an indication of the level of intelligence that is required by individuals employed in the position. It was anticipated that testing current operators on the WPT and comparing these results to those suggested as being optimal or sub-optimal for the operators would provide an interesting insight into the aptitude levels of those currently employed as harvesting machine operators.

The WPT consists of 50 questions of a problem solving type that progressively increase in difficulty throughout the course of the test. Participants are allowed 12 minutes in which to answer as many of the test questions as they can.

Procedure

The job analysis procedure consisted of three parts:

I. Observation of the job and reviewing background job information.
II. The administration and subsequent analysis of the PAQ.
III. The conducting and interpretation of the job analysis interview.

Observation

The observation of the mechanised harvesting task was useful for a number of reasons. It provided the analyst with exposure to the setting and context within which the job is conducted, it allowed for informal conversations to be conducted with a number of different operators, and it enabled the analyst to view directly the machine and operating equipment central to the position. The observational process also provided an invaluable source of job information that was later drawn upon during the PAQ and job analysis interviews.

Four separate trips were made into the forests within the Central North Island. The first of these was in conjunction with Waratah personnel who were called in to examine a machine fault. This initial exposure allowed for observation of the context within which the job was conducted. Initial impressions were that it was a very physically and mentally demanding task done in somewhat uncomfortable conditions.

The second trip provided similar experience and exposure to a different harvesting operation. This second observation revealed the task to be one that was potentially life threatening and highlighted the importance of working as part of a team or system and adhering to specified rules and standards of practice.

The third trip involved taking photographic and video footage that was used at a subsequent stage in the analysis. This third trip involved four hours of observation and informal conversations with the operator in regards to the human computer interface used in the task and the controls associated with the operating equipment.

The fourth trip provided similar exposure. During this session the researchers were able to observe more closely from within the cab the calibration process. This also allowed for observation of the tasks required to harvest trees into logs. It revealed extensive hand and finger movements, and the transcribing process by which cutting specifications are entered into the computer. It was also clear that operators are exposed to extensive vibration and jolting around during the harvesting task.

Review of Job Related Information

There is unfortunately little job-related information available on the operation of harvesting machines. Most of the previous research done in this area is from a machine or systems perspective and not on the job or the human factor involved in the operation of harvesting equipment. Work by Sullman & Kirk (1998) has highlighted the very heavy mental workload that is associated with the task. Using a well known subjective method, it was found that operators experienced similar mental workloads to simulated air traffic control, the simulated flying of an F-16 and were considerably higher then the workload of commercial airline pilots. Similar findings have been found in overseas research (Inoue 1996).

Publications by Byers (1995), Kirk, Byers, Parker and Sullman (1997) and Cummins (1998) have highlighted the increasing complexity associated with the task due to the increased involvement of computers and higher demands for log optimisation. The task is also conducted in a notoriously dangerous context (Parker 1997).

In addition to this, the logrite controller manual was examined. The controller is incorporated into the majority of the Waratah type harvesting machines and as such provided useful information about the operation of the machine.

The Forest Industry Record of Skills System (FIRS) for machine operating and mechanical processing also provided an invaluable source of information on the types of knowledge and abilities that are required of operators to obtain qualification. The module covers the competencies, training delivery information and assessment criteria for skills modules in the forestry industry record of skills. The modules are combinations of the New Zealand Qualification Authority Units of learning and form part of the National Certificate In Forest Harvesting (LFITB 1994).

The FIRS module identifies eight separate competencies that mechanised harvester operators need to possess. These include general knowledge, safety, planning, communication, operating, presentation, maintenance and efficiency.

The Position Analysis Questionnaire

Seven operators took part in the PAQ aspect of the analysis. They were all currently operating in the Central North Island. Contact names and numbers were obtained from Waratah and also from other members of LIRO who had made previous contacts with mechanised harvesting operators. Once initial contacts had been made, interview times were arranged at a location convenient to the operators. Most of the interviews were conducted in the evening and all were conducted outside of work hours and in the operators' homes. All operators received a complimentary dinner voucher for taking part in the research.

The interviews took approximately one and a half-hours to complete and involved a highly structured, standardised progression through the 194 elements included in the PAQ (see Appendix A). Prior to the interview, operators were assured that it was the position itself that was under investigation rather then their own ability to operate the harvester. They were also asked to provide a brief description of their job and the responsibilities associated with the position. They were assured of anonymity.

After each interview was completed the information obtained from the responses were analysed. The analyst then proceeded to attach scale ratings to each of the 194 job elements based on the information obtained from the interview. Once all seven PAQs were completed in this way, and checked for consistency through the 'ENTERACT' program, a final version of the PAQ was constructed. This was done by a careful comparison of the ratings across interviews and a final comparison to the specific item under consideration. A final scale ranking was then applied to each item. This final version was then tested for consistency through the 'ENTERACT' data entry software, and sent off to PAQ incorporated for analysis. A copy of the output obtained from the analysis is included in appendix 1.

Job Analysis Interview & Wonderlic Personnel Test

The administration of the Wonderlic Personnel Test (WPT) and the general job analysis interview were combined into one interview. The collaboration was administered to four different operators in the evenings within their own homes. The operators were contacted in the same way as those who were included in the PAQ aspect of the analysis.

Operators were assured that their responses to the interview and their performance on the WPT would remain anonymous. Operators were informed that the WPT was being used to measure or provide some indication as to the current problem solving ability of mechanised harvester operators. The test was administered at the start of the interview and operators were given the prescribed time limit of 12 minutes to complete the test.

The more generalised job analysis interview was a standardised procedure that contained four major areas of investigation:

1) Describe major responsibilities

Operators were asked to describe the major responsibilities or areas of responsibility that are associated with the job.

2) What do you think separates a good operator from a poor one?

Operators were asked to describe what they believed separated a competent operator from a less competent operator.

3) What skills / aptitudes / abilities are needed to operate well?

Operators were asked what skills and abilities they believed were needed to perform well at the mechanised harvesting task.

4) Describe tasks required to do & how they know when they have done them well?

Operators were asked to describe the tasks and activities they were required to carry out on the job and how they know whether or not they have done a good day's work.

Findings

Job Analysis Interview / Descriptive Information

The generalised job analysis interview combined with the PAQ allowed for the development of some key descriptive information. What follows is a job description of the mechanised harvesting task, a description of the job context, the key result areas and key tasks found in the position, the core competencies of machine operators as identified through the analysis and the critical success factors associated with the position.

Purpose of the position & Job description

The primary role of the mechanised harvesting position is to obtain the maximum value from logs by specialised selection, measurement, marking and presentation of the logs. The position involves operating mechanised equipment that carries out all or part of the harvesting cycle. Mechanised harvester operators work as part of a crew based system where trees are harvested, cut to pre-specified lengths and distributed to other locations for further processing.

Context of the position

Environment- Task executed in an outdoor environment, which is often subject to changing weather conditions. May be exposed to harsh, variable weather conditions and unusual terrains. A potentially hazardous working environment.

Working relationships- Mechanised harvester operators are expected to work in a team or crew based context that involves close contact with other workers in the working environment. More specifically, this involves contact with:

- Other Foresters-Machine operators
- Supervisors
- Contractor

- Marketing people (Saw mills)
- Researchers (LIRO)
- Semi-professional people-Mechanics
- Sales people-Waratah personnel, machine manufacturers.

Key Result Areas and Key Tasks

Key Result Area	Key Tasks
Produce Required Amount of Logs to Specified Standards	Plan processing location for most efficient operation Ensure measuring devices are functional and reading accurately Ensure piece size is within the machine's capacity Input cutting specification into controller Carry out pre-start visual inspection Follow recognised start up and shut down procedures Test all controls prior to operation Ensure machine is positioned on stable, level ground (where applicable) Exercise caution when extracting log from stockpile Operate harvester using correct combination of control activations Be aware of any tailswing of boom and /or logs Avoid stem damage from too much knife or grapple pressure Place oversized / out of spec trees to one side Identify defects Drive / manoeuvre machine base Maintain steady, even rate of processing Perform consistently in a methodical, efficient and safe manner. Interact with other crew members
Fix and Maintain Machine	Detect mechanical and hydraulic problems before they become too serious Identify cause of problems and rectify Perform regular maintenance activities such as oiling and lubricating Know when to contact mechanic Secure or replace loose screws, bolts and/or nuts Regularly inspect oil and water levels Regularly inspect structural components for stress fractures Remove all debris from around hot components Keep cab clear of all debris and loose equipment Use correct tools to perform maintenance tasks Keep all tools and ancillary equipment secure and safe Perform regular inspections of hydraulic hoses Keep all electrical components protected from moisture Maintain sharpness of delimbing knives and cutting attachments Make sure all electronic length measuring devices have clean lenses and unobstructed vision of logs
Input Into Crew Functions	Maintain speed and efficiency for other crew members Understand specified signals Respond to all signals given Be aware of other crew members Ensure other workers are conscious of machine, boom and log movements Issue clear, positive instructions where necessary
Maintain Safety of Self and Others	Wear and maintain all personal safety equipment and protective clothing Ensure that all machine safety features are functional

	Ensure that all steps, grab handles, screens and guards are in place and functional Test the emergency stop mechanism on a regular basis Clean up any fuel or lubricant spillage Recognise hazardous working situations and take appropriate defensive actions Work within the machines capabilities Consider the safety of others near the machine Anticipate the movement of flying branches and/or debris Check that the fire extinguisher has been serviced and is suited to the machine Enter and leave the machine in the correct manner Complete hazard identifications if required Be aware of own mental and physical limitations Maintain vigilance at all times

*Tasks taken from LFITB (1994).

Core Competencies for the Mechanical Harvesting Task

Competency 1 – Log Making Ability

The primary function of the harvesting machine is to fell and de-limb trees and cut them into specified lengths or log make. This is the overall purpose of the position and constitutes the major responsibility of the task. Encapsulated within this competency are two major divisions of responsibility. These are production total and production quality.

The speed and quality of output are two factors that often counter-act one another. In order to perform to a quick pace operators often have less time to ensure production quality. Similarly, the increased time expenditure associated with ensuring quality negatively impacts on the production count. A fine balance between the two factors is required.

To ensure quality log making, harvester operators need to be able to identify a variety of stem features and defects. These include: knots, stem diameters, roundness, splits, sweep, damage, rot and sap stain. Unfortunately, these features are often quite difficult to detect (Cummins 1998b). Previous experience with manual logmaking on the skid is often an invaluable experience for machine operators to have. It introduces them to the factors involved in log making and meeting specifications and adhering to cutting instructions while at the same time allows them to become familiar log types and the various defects they will encounter once operating the machine.

Competency 2 – Mechanical Ability

It is imperative that harvester operators be mechanically minded or posses highly competent mechanical abilities. Two separate features of the position combine to emphasise the importance of this competency. These are the need to maintain the machine for general everyday functioning, and the need to conduct mechanical repairs in the event of breakdowns or machine problems.

The operators included in the analysis indicated that general maintenance responsibilities in the form of greasing, oiling, sharpening blades, and general mechanical activities are an integral part of the position requiring anywhere from between 30 minutes to an hour a day. One operator suggested

that the maintenance side of the job is useful for two purposes. It keeps the machine running smoothly and if broken up throughout the day can also allow the operator to get out of the cab every hour or so, have a stretch and a mental break from processing.

Eventual breakdowns are an unfortunate reality due to the nature of the task. Breakdowns can occur at any time and are often a re-occurring problem. If mechanics were needed to come out every time there was a problem with the machine, it would be a very time consuming and expensive practice. As such, it is important that operators be able to fix as many of the problems by themselves. Generally the more competent mechanically an operator is the better.

The quality of the machine operator can have a direct effect on the amount and severity of the mechanical problems that occur. Quality operators are defined as those who produce the required amount of in specification logs and who know how to look after their machines. Poor quality operators are those who rush their work and push the machine beyond it's limits. This type of behaviour may not show up immediately but will eventually lead to breakdowns and mechanical failures. The hydraulic nature of the machine and harvester head is a related issue. Operators need to have a good understanding of hydraulics.

Competency 3 – Computer Knowledge

All of the operators included in the analysis utilised the Waratah group of harvesting machines. The Waratah contains a computer-based interface and as such leads to the importance of the present competency. Operators asserted that it is desirable or useful to have had some previous experience with computers due to the increasing reliance on computers in forestry machines. Operators with less experience with computers and more advanced technologies are likely to be less confident and take longer to familiarise themselves with the task (Henderson, Smith & Henderson 1992).

Competency 4 – Positioning Machine & Logs

It is also important that operators adequately position themselves and the machine within the working environment. Poor positioning will lead to reach and space problems, balance problems and will ultimately negatively impact on production levels and production quality.

Competency 5 – Drive Machine Base

In order to fulfil the requirements of dimension four and the task in general, operators need to be able to drive the base of the harvesting machine. The majority of harvester heads are fitted to excavator bases (Cummins 1998b). As such they need to be competent at re-positioning and moving the machine to predetermined locations.

Competency 6 – Awareness of Safety

It is imperative that harvester operators be fully aware of the issues surrounding the safety of themselves and those working around them. This involves having knowledge of and complying

with standard operating procedures, hazard identification processes, Occupational Safety and Health guidelines and being vigilant to what is occurring in the work environment at all times. In addition to this operators need to be conscious of the limitations of themselves and the machine.

Competency 7 – Personality Characteristics

The operators involved in the analysis identified a number of personality based features that they believed are important for an operator to possess. These included being easy going, reliable, attentive to detail and determined to accomplish the goals set for the day. In addition to this it is important that harvester operators possess the following:

- Initiative -Can work without supervision
  -Is a self-starter, can accurately diagnose problems and solve them
- Flexibility -Demonstrates an openness to new tasks, techniques and technologies
  -Can adapt to change in work schedules and deadlines
- Pressure/Stress Tolerance
  -Ability to handle stressful situations and display composure over own feelings
  -Can maintain good working relationships during stressful periods

Competency 8 – Participate as Part of a Team

Mechanised harvesters are a central component of any contracted work group. In many situations they are the hub of the entire harvesting process and if they are not working to a high standard then the entire crew is frustrated. As such, it is important that Waratah operators be able to work as part of a team.

- Team Work and Co-operation
  -Keeps others informed of actions and works inside agreed parameters
  -Works well with others sharing accountabilities and outputs
  -Participates and contributes constructively to the operation of the group

Position Analysis Questionnaire

One of the great benefits associated with the Position Analysis Questionnaire is its ability to derive interesting job based information that other analysis methodologies cannot produce. As the analysis is a standardised procedure, jobs and positions can be compared on a normative basis with other jobs or positions on a variety of dimensions (See Appendix 2).

Job Evaluation

One of the most practical applications of the information obtained from the PAQ revolves around the level of compensation that should be associated with a job. Job evaluation is the process by which wage rates are applied differentially to jobs (Landy 1989). Traditionally, job evaluations

Position	Job Eval. Points
Factory Manager	1250
Packing Supervisor	765
Purchasing Officer	754
Rehabilitation Coordinator	727
Electrical Foreman	692
Senior Lab Technician	691
Production Supervisor	618
Warehouse Foreman	608
Distribution Administrator	596
Carpenter	576
Electrician	568
Tanker Driver	543
Materials Controller	535
Microbiologist	531
Despatch Clerk	513
Accounts Clerk	501
Laboratory Technician	481
Receptionist	475
Payroll Supervisor	473
Groundsman	446
Bottle Washer	440
Mechanised Harvester Operator	440
Fork-lift driver (Brewery)	423
Brew-house Processor	422
Tanker Loader	416
Packing Machine Operator	414
Bottle Washer	409
Bottle Wash Machine Operator	409
Warehouse Staff	406
Scanner (brewery)	396

Table 2- Rank order position of harvesting task in terms of job evaluation points.

have been based upon the differences among jobs in terms of factors such as aptitude and skill requirements and the type of responsibilities and tasks required of the workers. Other approaches involve combining the job evaluation process with other administrative processes such as wage market studies, negotiations with employees and an analysis of related strategic factors (Davis & Sauser 1991).

Of central importance in the discussion of pay rates related to jobs is the question of what standard or criterion should be used to determine the value of a particular position. A variety of alternatives have been proposed and the PAQ has adopted the criterion characteristic of the occupational structure in today's economy which applies 'going rates' to the supply and demand of certain skills, abilities and acceptance of work responsibility and working conditions.

A number of studies have utilised the PAQ for the purpose of assigning wage rates and pay levels to jobs. Early research by Mecham and McCormick (1969) sought to identify the relationship between the job dimensions of the PAQ and going rates for compensation and indicated that the analysis could be used successfully as the basis for a job evaluation system. Subsequent research has used

the PAQ for the development of job evaluation plans and compensation programs in both the public (Robinson, Wahlstrom & Mecham 1974) and private sectors (Jeanneret 1980).

The PAQ represents a compensation rate in the form of job evaluation points. This score is somewhat arbitrary when observed in isolation but when compared with other jobs that have been analysed with the PAQ in a particular organisation or societal structure, interesting comparisons can be made which can then be used as the basis for establishing pay or remuneration rates.

Based on the results from the analysis, the job evaluation points associated with the mechanised harvesting position are 440. Table 2 represents the rank order position of the harvesting task as compared to other positions in the New Zealand PAQ database. This indicates that a greater compensation rate should be associated with the position than that of many of the positions found in a large brewery company and food distributor in this country.

Job Prestige

A related yet distinct measure of worth is the Job Prestige Score (JPS). Within New Zealand and most other countries some jobs are considered to be more desirable or prestigious then others. The nature of occupational prestige has been the focus of sociological research for a number of decades now as the concept reflects a number of interesting and important social values and factors such as inequality, power, privilege and status.

Trieman (1977) has conducted an extensive comparative analysis of occupational hierarchies in over 60 societies both past and present. Based on the popular evaluations of the prestige of positions taken from surveys and on data on occupational skill and wealth levels drawn from census and other sources, Trieman concluded that occupational prestige hierarchies are fundamentally similar across all societies. Because of this he went on to develop a cross-nationally valid occupational prestige scale that can be used as a standard measure of job prestige. The PAQ has since adopted this measure and incorporated into the output of job analysis conducted with the method.

Multiple regression on the job dimensions associated with the PAQ have indicated that two job dimensions in particular are most strongly related to high prestige scale values. These are having decision, communication and general responsibilities and performing technical and related activities.

On the basis of these dimensions, the job prestige score associated with the mechanised harvesting task is 32.5. Again, when viewed in isolation this score is somewhat meaningless. When used for comparative purposes with other positions in the New Zealand database however the score can be used as an indication of the relative level of prestige associated with the harvesting position. The score places the position somewhat above the more manual positions and slightly below the more managerial, technical related positions in the brewery and food dispatcher industry in this country in terms of prestige (Table 3).

Position	J.P Score
Senior Laboratory Technician	53
Distribution Administrator	51
Payroll Supervisor	50
Factory Manager	50
Field Officer	50
Materials Controller	49
Accounts Clerk	49
Purchasing Officer	48
Dispatch Clerk	47
Microbiologist	47
Production Supervisor	46
Packaging Supervisor	46
Rehabilitation Coordinator	46
Receptionist	45
Electrical Foreman	43
Electrician	40
Mechanised Harvester Operator	32.5
Dispatcher Operator	32
Can Filler	29
Warehouse foreman	28
Tanker Loader	26
Bottle Washer	25
Scanner	25
Carpenter	25
Materials Handler	24
Packing Machine Operator	23
Tanker Driver	23
Fork-lift Driver	19
Groundsman	18

Table 3- Rank order position of harvesting task in terms of job prestige.

What is interesting is that on a number of occasions, the job prestige score associated with the harvesting task is higher then those associated with other positions which have a higher job evaluation score associated with them. This would be accounted for by the relatively higher degree of performing technical and related activities associated with the harvesting position.

What would be interesting would be to use the PAQ to conduct a comparative investigation into the relative job evaluation and job prestige scores associated with different jobs within the forestry sector. This could then be compared with actual compensation rates and the perceived prestige associated with the different positions.

Test Predictions

The PAQ also provides a series of test predictions associated with the General Aptitude Test Battery (GATB) developed by the United States Employment Service (U.S. Department of Labor 1970). corresponding predictions for a variety of commercially available tests that measure GATB constructs such as the Wonderlic Personnel Test (1998) (WPT) are also available. Parts of the GATB have previously been used successfully for selection purposes in forestry in the United States (Logging News 1976).

Perhaps a more important type of information in terms of the objectives of the current analysis is the probability of use and the predicted validity coefficients associated with the GATB tests. Based on the information obtained from the analysis, the PAQ indicates which aspects of the GATB would be most useful in a selection procedure for the harvesting position. The analysis indicates that an intelligence test, some form of visual perception test and some form of manual dexterity test should not only be included in the test but would also serve as useful predictors of subsequent performance in the harvesting task (Table 4).

GATB Tests	Prob. of Use	Pred. Val. Coe
Intelligence	0.26	0.20
Numerical Aptitude	0.23	0.22
Spatial Aptitude	0.25	0.18
Form Perception	0.33	0.21
Manual Dexterity	0.77	0.19
Motor coordination	0.33	0.17

Table 4- Probability of use and predicted validity coefficients associated with the GATB tests.

Wonderlic Personnel Test

One of the tests associated with the GATB is the Wonderlic Personnel Test (WPT). The PAQ predicted a score range of; low = 14, Average = 22 and high = 32 as the predicted levels at which individuals employed in this position should be attaining to on the WPT. This is a relatively high predicted level of attainment in comparison to positions with similar job prestige and job evaluation scores within this country and is in fact more comparable with positions with job prestige scores of between 45 and 55. Scores of this type are associated with technical, engineering, supervisory and more advanced clerical type roles (Trieman 1977). Similarly, the WPI scores are similar to those positions with job evaluation scores of between 00550 and 00850. Again these positions are of the more technical, engineering type.

The actual scores that the current operators achieved on the WPT are located in Table 5. They reveal quite a distribution in terms of the problem solving ability of current operators. Two of the operators performed to a low to average level in terms of the predicted score range for operators and one operator performed very poorly. One operator however performed exceptionally well, with a score towards the high end of the predicted scale.

Operator	Correct Resp.	Incorrect Resp
1	23	7
2	30	3
3	11	5
4	17	15
Average	20.25	7.50

Predicted score range on the WPI (low=14, avg=22, high=32).

Table 5- Number of correct and incorrect responses of operators on the WPT.

One point to draw from this part of the job analysis is that those individuals with higher intelligence scores are more likely to make more competent operators (Schmidt & Hunter 1998). This assertion has already gained incidental support in the current research in that the operator who scored the highset on the WPT also plays the dual role of crew foreman or supervisor.

Selected PAQ items

Some of the more noteworthy PAQ items that are worth mentioning are the extreme importance associated with depth perception in the job. This reflects not only the importance of seeing things from a distance but also judging the distance or position of objects relative to one another (PAQ Technical Manual 1989). Since depth perception is largely associated with bi-lateral vision, it is imperative that operators have good quality vision in both eyes. The importance of this dimension would be accounted for by the large amount of rotating the cab that is done, the need to position the Waratah head in order to pick up trees, and the importance of being aware of what other people are doing on the skid.

Job related experience in the form of general skid work, manual log making and experience with operating other machinery be within the range of at least one to three years. In addition to this it is suggested that between 30 days and 6 months needs to be allocated for job training before an operator becomes competent and confident.

PAQ Items With Highest Percentile Scores

The PAQ items that received the highest rankings and their subsequent percentile scores are listed in Table 6.

PAQ Item	Rating	%ile
Powered Mobile Equipment	5.0	99
Observing Features of Nature	5.0	99
Hand-Operated Controls	5.0	99
Vibration	5.0	99
Highly Skilled Body Coordination	5.0	99
Operating Equipment	5.0	99
Machines/Equipment	5.0	99
Repetitive Activities	5.0	98
Limb Move. Without Visual Cont.	5.0	98
Vigilance	5.0	98
Materials in Process	4.5	97
Eye-Hand/Foot Co-ord.	5.0	97

Table 6- PAQ items with the highest rankings.

All of the above items reflect the manually and mentally/perceptually demanding nature of the task. The mental aspect of the task is not so much intelligence based in the form of verbal or numerical aptitude but rather mentally demanding in terms of vigilance, attention and workload.

Divisional Dimensions

In addition to the six major divisions of the PAQ (information input, mental processes, work output, relationships with other people, job context and other job characteristics) factor analysis of the PAQ items has identified 45 separate dimensions of work (see Appendix 2). These dimensions represent a variety of combinations of the separate PAQ elements. The scores for the harvesting task on each dimension is calculated by the sum of the standardised responses for the individual job elements multiplied by the weight or statistically derived importance of the element (PAQ Technical Manual 1989).

What follows is a summary of the divisional dimensions according to the six divisions and a discussion on the more salient aspects of the analysis.

- *Division 1: Information Input*

The important dimensions within this division or ones in which the mechanised harvesting task has scored very highly are; interpreting what is sensed, evaluating and/or judging what is sensed and being aware of environmental conditions. Surprisingly, using various senses scored particularly low (Table 7).

Divisional Dimension	Score	%ile
Interpreting what is sensed	0.72	77
Using various sources of information.	-0.73	25
Watching devices/materials for info.	-0.35	38
Evaluating/judging what is sensed	0.86	81
Being aware of environ. Conditions	1.35	92
Using various senses	-1.04	16

Table 7- Dimension scores and percentile rankings in division 1: Information input.

- *Division 2: Mental Processes*

The two dimensions within this division (Making decisions and processing information) scored relatively low percentile wise (Table 8). When the dimension scores are compared to other positions of a similar nature in terms of job evaluation and job prestige however, the scores are relatively high (Table 9).

Divisional Dimension	Score	%ile
Making decisions	-0.42	35
Processing information	-0.58	30

Table 8- Dimension scores and percentile rankings in dimension 2: Mental processes.

Position	Making Dec.	Proc. Info.
Mechanised Harvesting	-0.42	-0.580
Tanker driver	-0.40	-1.560
Warehouse staff	-0.89	-1.170
Brew-house operator	-0.63	-1.500
Laboratory technician	-0.53	-0.210
Tanker loader	-1.89	-0.904

Table 9- Dimension scores of mental processes in harvesting task compared to other positions similar in terms of job prestige and job evaluation score.

- *Division 3 – Work Output*

As would be expected from the nature of the task, manual and mechanically related dimensions scored very highly (Table 10). More specifically, using machines and/or tools and/or equipment, controlling machines and / or processing, performing controlled manual and/or related activities and general physical coordination scored very highly. The very low score on the performing skilled and / or technical activities was somewhat surprising. It is a skilled job!

Divisional Dimension	Score	%ile
Using machines, tools or equipment	2.37	99
Performing act. with gen. body move.	-1.68	6
Controlling machines or processes	1.79	97
Performing skilled / technical act.	-2.17	3
Performing controlled manual act.	0.75	78
Using equipment or devices	0.06	53
Performing handling or manual act.	-1.64	7
General physical coordination	1.40	92

Table 10- Dimension scores and percentile rankings in division 3-work output

Four of the five dimensions within this division scored around about the 50th percentile (Table 11). Communicating judgements and/or related information was the only exception and scored particularly low.

Divisional Dimension	Score	%ile
Communicating judge & related info	-1.16	14
Engaging in general personal contact	-0.08	48
Supervising / coordinating act.	-0.27	41
Exchanging job related info.	0.33	63
Public / related personal contact	0.35	64

Table 11- Dimension scores and percentile rankings in division 4- Relationships with other people.

- *Division 5 – Job Context*

The analysis indicates a very high score on being in a stressful and unpleasant environment (Table 12). This however may not be the case as many forestry workers enjoy working in the outdoor environment and research suggests that this may be one of the main motivations for taking up a career in forestry (Garland 1986). The stress factor will however be addressed at a later stage in the report.

Divisional Dimension	Score	%ile
Being in a stressful / unpleasant envir.	1.31	91
Engaging in personally demanding situations	-0.84	22
Being in hazardous job situations	0.12	55

Table 12- Dimension scores and percentile rankings in division 5- Job context.

- *Division 6 – Other Job Characteristics*

The interesting dimensions to note in this division is the high degree of structure within the job and the importance of remaining alert to changing conditions (Table 13). The latter of these two dimensions reflects the extremely vigilant nature of the task. Remaining alert at all times on the job to continually changing events and circumstances is important. More specifically, operators must be aware of who or what other machines are entering the operating space, the position of the tree in the head, identifying defects at a quick pace and generally maintaining the flow of productivity. Similarly, operators need to be monitoring infrequently occurring events or circumstances such as machine / head breakdowns, system failures or changes to cutting specifications.

This high level of vigilance reflects the high demand placed on the operator's mental workload as outlined in research done by Sullman and Kirk (1998).

Divisional Dimension	Score	%ile
Working non-typical vs. day schedule	-0.95	19
Working in a business like situation	-1.54	8
Wearing specified vs. optional apparel	0.25	60
Being paid salary vs. variable basis	-0.37	37
Working on a irreg vs reg schedule	0.49	69
Working under job demand circum.	-1.12	15
Perf. Unstruc ve struc work	1.71	96
Being alert to changing cond.	1.23	90

Table 13- Dimension scores and percentile rankings in division 6- Other job characteristics.

Attribute Ratings of an Interest or Temperament Nature

The attribute ratings of an interest or temperament nature section of the report provide an indication of the type of temperamental qualities that an operator should possess. Of particular interest is the importance of time pressure or more specifically the ability of operators to deal with the pressures of time. A similar dimension was identified throughout the course of the job analysis interviews where operators consistently pointed out that it was imperative not to get too 'stressed out' and to remain calm and relaxed.

Understandably the processes / machines / techniques attribute rating was also very high. This reflects the obvious importance associated with an operator having a sound understanding of processes, machines and related techniques. Previous experience on other machines would provide a good indication as to an operator's proficiency in these areas as too would a test of mechanical reasoning.

Sensory alertness, and in particular visual alertness is also important. Good quality visual ability is imperative and potential operators could possibly be required to undergo an eye examination. As was previously mentioned, judging distance is largely dependent on bi-lateral vision and as such operators need good eye-sight in both eyes.

The long hours associated with the mechanised harvesting task and the high degree of vigilance and mental workload involved in the job is likely to cause fatigue in operators (Davies & Parasuraman 1981). Susceptibility to fatigue may be a useful thing to assess for during the selection process.

Attribute Ratings of an Aptitude Nature

The attribute ratings of an aptitude nature identified by the PAQ provide an indication of the aptitudes an operator of a mechanical tree harvester should possess. A number of the aptitudes reflect one particular dimension of importance which could be referred to as perceptual ability (Table 9). More specifically, movement detection, perceptual speed, spatial visualisation, spatial orientation, far visual acuity, visual form perception, depth perception, and eye-hand/foot coordination are all elements of good perceptual ability. Again, mechanical ability received a very high score and reflects the importance of operators being proficient in the area of mechanics and mechanical maintenance.

Manual and finger dexterity also scores highly and reflects the large amount of manual activity and in particular finger manipulation and movement involved in the task.

Although intelligence has scored quite lowly, such a measure cannot be underestimated or overlooked in the selection process. Intellectual ability may not be of central concern to the harvesting position, but it affects a number of related abilities such as learning, adaptability, reaction time and other factors of importance. It also provides a consistently useful predictor of performance across work tasks and job types (Schmidt & Hunter 1998). In addition, due to the increasing importance of computers and sophisticated equipment and technologies the harvesting task will increasingly require high intellectual ability and adaptability in thinking

Stress On The Harvesting Job

A study assessing the mental workload associated with the mechanised harvesting task indicated that operators experienced extreme levels of mental workload, similar to those of air traffic controllers and higher then those of commercial airline pilots (Sullman & Kirk 1998). Mental workload is considered by many to be a strong indicator of stress in an occupation (Meshkati, Hancock & Mansour 1990). The obvious conclusion one would come to is that the mechanised harvesting task is a stressful one. Such an assertion has been made by operators during the course of this job analysis and this section of the report will go on to discuss the PAQ in relation to the stress found in the harvesting task.

Stress is a relatively difficult phenomenon to measure and define and there is a considerable amount of evidence which suggests that reasonable levels of stress are required to fulfil some tasks. Early work by Endo and Kogi (1975) has indicated that stress is not an entirely negative thing to experience within the workplace. They suggest that stress within the work situation may actually have stimulating effects increasing performance in vigilance based tasks.

This leads to one of the important aspects of stress – its meaning. The successful measurement of stress has long been an aim of research within the areas of psychology and ergonomics. The idea is that if you can successfully measure stress it will be possible to ascertain the level of mental effort required to carry out a task with the consequence that the success of the redesign of work, will be relatively easy to evaluate. Job evaluation would also be made easier where the ranking of jobs in terms of their stressfulness could become a powerful part of the pay negotiation process.

The attempts at measuring stress have been diverse. Behavioural measures of stress are generally divided into three broad categories: subjective opinions, spare mental capacity and the primary task method and more recently physiological measures (Williges & Wierwille 1979). Eggemeier (1981) and Reid, Shingledecker and Eggemeier (1981) have developed a mathematical procedure called conjoint measurement to obtain a work load scale using subjective opinions. Another approach has been adopted by Derrick (1981) using mulitdimensional scaling.

A popular method is the secondary task approach which uses the logic that the mental capacity that an individual has is limited and that the individual's performance will deteriorate when a number of activities are loaded on the individual at the same time (Wickens 1984). It is presumed that the level of performance in the secondary task is an indication of the mental effort or demands required to carry out the preliminary task effectively.

Other attempts at measuring stress have involved physiological measures such as sinusarhythmia, blood sugar level, E. C. G. (Electrocardiogram), E. E. G.(Electroencephalogram), and E.D.A.

(Electrodermal activity). Here, there is a presumption that mental effort causes a physiological reaction in the body. Certainly this may be possible but it has to be concluded from the research evidence that any connection is at best indirect. These measures of stress are therefore reasonable crude but even so they do provide an indication of the degree of improvement in a job and should not be dismissed completely.

It is argued that the sensible and in our opinion meaningful approach to stress research is to move away from subjective feelings of stress which although possible to relate to may be somewhat intangible. Consequently although we can feel stressed at any particular time by a particular job activity, the only justification for calling the situation truly stressful is if it has a negative effect in terms of a significant relationship with physical and psychologically negative health issues. Assessment of the stress levels associated with work was conducted by Shaw and Riskind (1983). Their study investigated whether or not any consistent relationship existed between the behavioural characteristics of different jobs and the levels of various stresses experienced by groups of employees in those jobs. The study assessed the behavioural characteristics associated with the jobs by using the PAQ data bank.

Shaw and Riskind (1983) conducted correlation and regression analyses in order to determine the relationship between job dimension scores derived from the PAQ and 18 indices of job stress obtained from previous research done by Milham (1976), Colligan, Smith and Hurrell (1977) and Caplan, Cobb, French, Harrison and Pinneau (1975). PAQ and stress data were matched using job titles and codes from the Dictionary of Occupational Titles (U.S. Department of Labor 1977). The results showed a strong relationship between PAQ scores and the stress data. A summary of the data is shown in table 14 where the figures represent the correlations or degree of relationship between the job dimensions of the PAQ and health defined stress related problems.

What is interesting to note from the perspective of the current analysis is the amount of job dimensions characteristic of stressful occupations that are prevalent in the mechanised harvesting task. More specifically, dimension 13- performing controlled manual and / or related activities scored very highly in the analysis (78%) and has been implicated in a number of stress related health problems. The same is true for exchanging job-related information, being in a stressful, unpleasant environment and being in hazardous job situations.

The implications from such an analysis is that the harvesting task is a stressful occupation and may lead to the health related problems outlined in the table. This information is based on research prior to the prevalence of occupational overuse syndrome so those factors will also come into play and does not take into consideration the physical stress associated with the task, which is likely to produce musculo skeletal problems.

PAQ Job Dimensions	Heart	Hypertension	Ulcers	Cirrhosis	Suicides	Falls	Mental Health Admissions
2. Using various sources of information.					.22	-.28	
3. Watching devices and/or materials.					.22	.25	
7. Making decisions.							.29
8. Processing Information.	-.32	-.26	-.25	-.28	-.30	-.45	
9. Using, Machines, tools or equipment.							-.22
10. Performing general body movement.				.25		.34	
11. Controlling machines or processes.							-.25
12. Performing skilled/tech activities.						-.22	
13. Performing controlled manual act.	.35	.29	.32	.30	.43	.44	
14. Using miscellaneous equip/devices.					-.28		
17. Communicating Judgement and related information.			-.21		-.22	-.25	
20. Exchanging job related information.	.23		.25		.24	.31	
21. Public/related personal contacts.					-.31	-.27	
22. Being in a stressful or unpleasant environment.	.33	.25	.29	.33	.34	.50	
23. Engaging in demanding situations.	-.22				-.28	.32	
24. Being in hazardous situations.	.33	.24	.30	.30	.45	.29	
26. Working in business situations.	-.30	-.24	-.26	-.24	-.35	-.45	
27. Wearing specified vs. optional clothing					.25		-.27
30.Working in demanding circumstances.						-.21	

Table 14- Intercorrelations among divisional job dimension scores and stress data.

Note. All correlations shown are significant ($p \leq .05$). The following job dimensions are not listed because they did not correlate significantly ($p \leq .05$) with any of the stress measures. (1) Interpreting what is sensed; (4) Evaluating/judging what is sensed; (5) Being aware of environmental conditions; (6) Using various senses; (15) Performing handling/manual activities; (16) General physical co-ordination; (18) Engaging in general personal contact; (19) Performing supervisory/co-ordination/ related activities; (25) Working non typical vs. day schedule; (28) Being paid on salary vs. variable basis; (29) Working irregular vs. regular schedule; (31) Performing structured vs. unstructured work; and (32) Being alert to changing conditions.

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JOB PROFILE - PART 1 File Name: 789

IDENTIFICATION INFORMATION

PAQ Number:909239 Organization Number: 789
Organization:Warata Group #: 0001 Record #: 0001
Job Title:HARVESTING Analyst Type: A
Dept/Unit:MACHINE
Analyst(s):/
Completed:05/17
DOT Number: N Reported # of Incumbents: 1

Processed:05/17/99

JOB EVALUATION, FLSA EXEMPTION AND JOB PRESTIGE PREDICTIONS

Equation(s) Used to Calculate Job Evaluation Points
(2)
Job Evaluation Points: 00440
Reported Median Monthly Compensation: 00100
Probability this job is EXEMPT from the Fair Labor Standards Act: 0.060
Job Prestige Score: 32.5

SELECTED PAQ ITEMS

#	NAME	RATING	MEANING
20	Near Visual Acuity	3.0	Moderate Detail
22	Depth Perception (Importance)	4.5	Extreme Importance
46	Education (Level or Equiv)	1.0	Lss Thn HS Diploma
47	Job-Related Experience	3.0	1 Year to 3 Years
48	Training (Time to Learn Job)	2.0	30 Days to 6 Mnths
49	Using Mathematics (Level)	2.0	Basic
65	Keyboard Devices	2.5	Average Importance
87	Level of Physical Exertion	3.0	Moderate
134	Supervision Received	2.0	General Supervisn
143	Noise Intesity	4.0	Loud

TEST PREDICTIONS

GATB TESTS	Predicted Score Range Low	Avg	High	Prob. of Use	Pred. Val. Coef.	SIMILAR TESTS	Predicted Score Range Low	Avg	High
G-Intelligence	77	91	106	0.26	0.20	- Adaptability	9	13	18
						Learning Abilt	26	33	39
						Wonderlic P.T.	14	22	32
V-Verbal Aptitude	75	89	102	0.05	0.14	- EAS-Verbal	5	10	14
						PTI-Verbal	7	16	27
						SET-Verbal	10	17	27
						DAT-Verbal Rsn	*	*	*
						DAT-LU Sentenc	*	*	*
						DAT-LU Spelling	*	*	*
N-Numerical Apt.	76	92	108	0.23	0.22	- Arith Fundmntl	23	30	35
						Arithmtc Index	29	37	44
						EAS-Numerical	9	20	31
						FIT-Arithmetic	18	25	32
						PTI-Numerical	5	11	17
						SET-Numerical	14	24	35
						DAT-Numrcl Abl	*	*	*
S-Spatial Apt.	81	98	116	0.25	0.18	- EAS-Spatial	12	21	30
						FIT-Assembly	6	9	12
						Mn Ppr Frm Brd	37	44	54
						DAT-Space Rltn	*	*	*
P-Form Percept.	75	93	111	0.33	0.21	- None			
Q-Clerical Percept.	83	97	110	0.62<	0.18	- EAS-Visual Spd	65	79	91
						Mn Clrcl-Names	87	108	127
						SET-Clerical	21	26	32
						DAT-Clercl Spd	*	*	*
K-Motor Coord.	75	92	110	0.33	0.17	- None			
F-Finger Dexterity	72	92	112	0.42<	0.16	- None			
M-Manual Dexterity	82	102	123	0.77<	0.19	- None			

(* Test scores correlated well with GATB scores, but norms were unavailable)

MYERS-BRIGGS TYPE INDICATOR (MTBI) (est. % of incumbents with high score on):

Extraversion 49	Sensing	72<	Thinking	57<	Judgment	68<
Introversion 51<	Intuitive	28	Feeling	43	Perception	32

PAQ ITEMS WITH HIGHEST PERCENTILE SCORES

#	NAME	RATING	%ILE
72	Powered Mobile Equipment	5.0	99
10	Features of Nature	5.0	99
66	Hand-Operated Controls, Frequent	5.0	99
139	Vibration	5.0	99
85	Highly Skilled Body Coordination	4.0	99
68	Hand-Operated Controls, Continuous	5.0	99
76	Operating Equipment	5.0	99
61	Machines/Equipment	5.0	98
170	Repetitive Activities	5.0	98
97	Limb Movement Without Visual Control	5.0	98
177	Vigilance: Infrequent Events	5.0	98
8	Materials in Process	4.5	97
160	Licensing/Certification Required	1.0	97
62	Activation Controls	5.0	97
96	Eye-Hand/Foot Coordination	5.0	97
178	Vigilance: Continually Changing Events	5.0	97
64	Variable Setting Controls	4.0	96
88	Sitting	5.0	96
22	Depth Perception	4.5	96
13	Events of Circumstances	4.5	95
63	Fixed Setting Controls	4.0	94
21	Far Visual Acuity	4.5	93
29	Estimating Speed of Moving Objects	3.0	93
78	Setting Up/Adjusting	3.5	92
67	Foot-Operated Controls, Frequent	3.0	91

JOB PROFILE - PART 2 File Name: 789

IDENTIFICATION INFORMATION

PAQ Number:909239
Organization:Warata
Job Title:HARVESTING

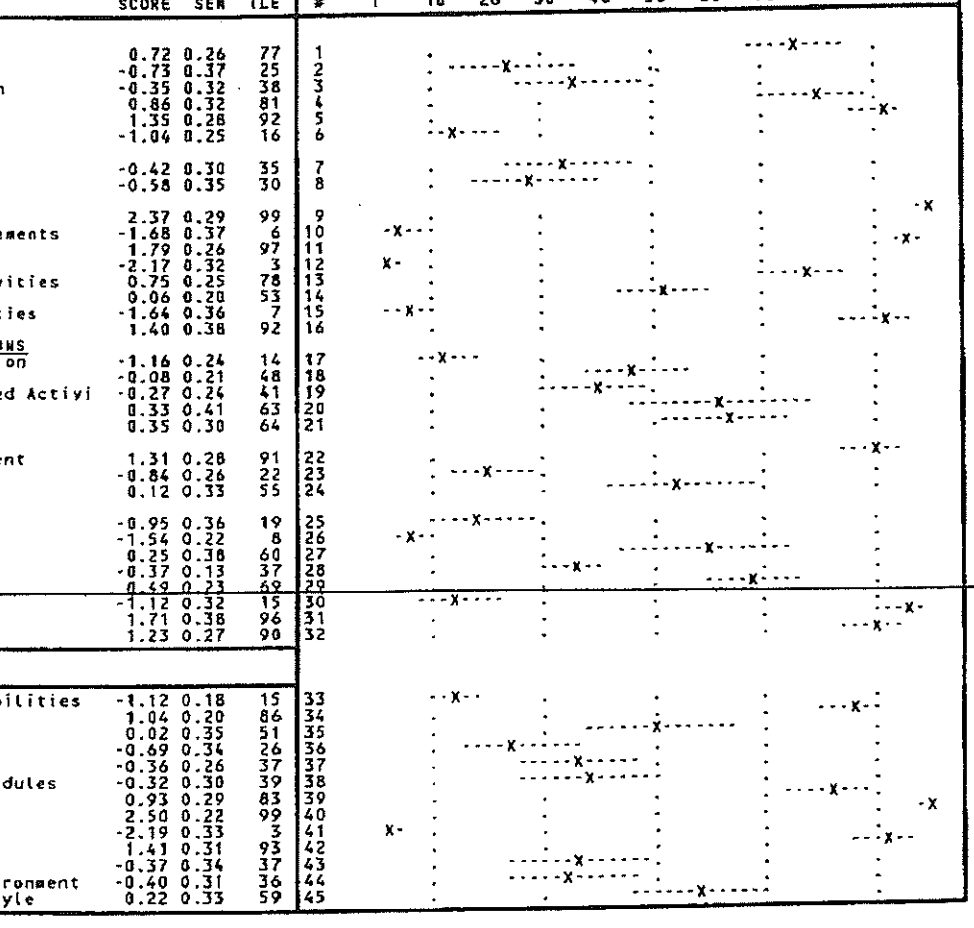
Organization Number: 789
Group #: 0001 Record #: 0001
Analyst Type: A

MEASUREMENT INFORMATION

The Standard Error of Measurement (SEM) Data are from records scored between 1987 & 1988

JOB DIMENSION PROFILE

DIVISIONAL DIMENSIONS	SCORE	SEM	PCT ILE
DIVISION 1: INFORMATION INPUT			
1 Interpreting What is Sensed	0.72	0.26	77
2 Using Various Sources of Information	-0.73	0.37	25
3 Watching Devices and/or Materials for Information	-0.35	0.32	38
4 Evaluating and/or Judging What is Sensed	0.86	0.32	81
5 Being Aware of Environmental Conditions	1.35	0.28	92
6 Using Various Senses	-1.04	0.25	16
DIVISION 2: MENTAL PROCESSES			
7 Making Decisions	-0.42	0.30	35
8 Processing Information	-0.58	0.35	30
DIVISION 3: WORK OUTPUT			
9 Using Machines and/or Tools and/or Equipment	2.37	0.29	99
10 Performing Activities Requiring General Body Movements	-1.68	0.37	6
11 Controlling Machines and/or Processes	1.79	0.26	97
12 Performing Skilled and/or Technical Activities	-2.17	0.32	3
13 Performing Controlled Manual and/or Related Activities	0.75	0.25	78
14 Using Miscellaneous Equipment and/or Devices	0.06	0.20	53
15 Performing Handling and/or Related Manual Activities	-1.64	0.36	7
16 General Physical Coordination	1.40	0.38	92
DIVISION 4: RELATIONSHIPS WITH OTHER PERSONS			
17 Communicating Judgements and/or Related Information	-1.16	0.24	14
18 Engaging in General Personal Contact	-0.08	0.21	48
19 Performing Supervisory and/or Coord and/or Related Activi	-0.27	0.24	41
20 Exchanging Job-Related Information	0.33	0.41	63
21 Public and/or Related Personal Contacts	0.35	0.30	64
DIVISION 5: JOB CONTEXT			
22 Being in a Stressfull and/or Unpleasant Environment	1.31	0.28	91
23 Engaging in Personally Demanding Situations	-0.84	0.26	22
24 Being in Hazardous Job Situations	0.12	0.33	55
DIVISION 6: OTHER JOB CHARACTERISTICS			
25 Working Non-Typical vs. Day Schedule	-0.95	0.36	19
26 Working in a Businesslike Situation	-1.54	0.22	8
27 Wearing Specified vs. Optional Apparel	0.25	0.38	60
28 Being Paid on a Salary vs. Variable Basis	-0.37	0.13	37
29 Working on an Irregular vs. Regular Schedule	0.49	0.23	69
30 Working Under Job-Demanding Circumstances	-1.12	0.32	15
31 Performing Unstructured vs. Structured Work	1.71	0.38	96
32 Being Alert to Changing Conditions	1.23	0.27	90
OVERALL DIMENSIONS			
33 Having Decision, Communication, and Gen Responsibilities	-1.12	0.18	15
34 Operating Machines and/or Equipment	1.04	0.20	86
35 Performing Clerical and/or Related Activities	0.02	0.35	51
36 Performing Technical and/or Related Activities	-0.69	0.34	26
37 Performing Service and/or Related Activities	-0.36	0.26	37
38 Other Work Schedules vs. Working Regular Day Schedules	-0.32	0.30	39
39 Performing Routine and/or Repetitive Activities	0.93	0.29	83
40 Being Aware of Work Environment	2.50	0.22	99
41 Engaging in Physical Activities	-2.19	0.33	3
42 Supervising/Directing/Estimating	1.41	0.31	93
43 Public and/or Customer and/or Related Contacts	-0.37	0.34	37
44 Working in an Unpleasant/Hazardous/Demanding Environment	-0.40	0.31	36
45 Having a Non-Typical Schedule/Optional Apparel Style	0.22	0.33	59



JOB ATTRIBUTE PROFILE

File Name: 789

IDENTIFICATION INFORMATION

PAQ Number:909239
Organization:Warata
Job Title:HARVESTING
Dept/Unit:MACHINE
Analyst(s):/
Completed:05/17
DOT Number: M

Organization Number: 789
Group #: 0001 Record #: 0001
Analyst Type: A
Reported # of Incumbents: 1

Processed:05/17/99

ATTRIBUTE RATINGS OF AN INTEREST OR TEMPERAMENT NATURE

NUMBER	TITLE	SCORE	EST % TILE
13	Pressure of Time	2.42	98
4	Processes/Machines/Techniques	2.18	97
14	Sensory Alertness	3.24	96
3	Dealing with Things/Objects	2.44	92
16	Working Under Specific Instructions	2.05	91
11	Personal Risk	1.39	91
2	Repetitive/Short-Cycle Operations	2.29	89
25	Susceptibility to Fatigue	2.57	84
15	Attainment of Set Standards	2.91	77
21	Tangible/Physical End-Products	1.78	76
5	Scientific/Technical Activities	1.61	41
22	Sensory/Judgmental Criteria	2.88	37
23	Measurable/Verifiable Criteria	2.15	28
17	Working alone	0.24	28
12	Conflicting/Ambiguous Information	2.18	22
18	Separation from Family/Home	0.21	11
27	Creative Activities	1.67	11
24	Interpretation from Personal Viewpoint	1.35	9
19	Stage Presence	0.32	9
20	Prestige/Esteem from Others	1.26	9
26	Dealing with Concepts/Information	1.18	8
10	Empathy	0.77	8
1	Variety of Duties	2.04	8
9	Directing/Controlling/Planning	1.13	8
8	Influencing People	0.46	7
6	Dealing with People	0.75	7
7	Social Welfare	0.71	5

ATTRIBUTE RATINGS OF AN APTITUDE NATURE

NUMBER	TITLE	SCORE	EST % TILE
69	Simple Reaction Time	1.84	99
76	Mechanical Ability	2.11	97
44	Movement Detection	1.67	97
42	Perceptual Speed	2.33	97
75	Rate Control	1.23	97
45	Spatial Visualization	1.83	97
55	Spatial Orientation	1.81	96
47	Far Visual Acuity	1.84	96
70	Response Integration	2.17	95
39	Visual Form Perception	1.77	95
48	Depth Perception	1.56	94
53	Tactual Acuity	1.56	92
54	Body Orientation	1.80	92
67	Eye-Hand-Foot Coordination	1.24	92
66	Eye-Hand Coordination	1.70	90
64	Continuous Muscular Control	1.97	89
61	Manual Dexterity	1.67	89
49	Color Discrimination	0.91	88
56	Kinesthesis	1.63	88
65	Rate of Arm Movement	1.26	87
68	Speed of Limb Movement	1.14	87
62	Arm/Hand Positioning	1.65	87
63	Arm/Hand Steadiness	1.27	86
74	Explosive Strength	0.73	86
71	Dynamic Strength	1.16	85
72	Static Strength	0.99	83
57	Finger Dexterity	1.03	80
73	Stamina	1.42	76
46	Near Visual Acuity	2.22	76
38	Aesthetic Judgment	0.46	59
52	Gustatory Acuity	0.03	56
51	Olfactory Acuity	0.14	53
43	Closure	1.76	37
40	Selective Attention	3.26	35
31	Numerical Computation	0.75	31
60	Problem Sensitivity	2.56	24
50	Auditory Acuity	1.29	22
41	Time Sharing	2.51	21
37	Short-Term Memory	2.15	19
32	Arithmetic Reasoning	1.20	18
36	Long-Term Memory	2.29	15
35	Intelligence	2.27	15
33	Convergent Thinking	1.65	10
34	Divergent Thinking	1.13	9
30	Oral Communications	1.09	8
58	Ideational Fluency	0.48	7
29	Word Fluency	0.84	7
59	Originality	0.49	6
28	Verbal Comprehension	1.17	6

Appendix 2- PAQ Job Dimensions

DIVISION DIMENSIONS

Technical Title	Operational Title
Division 1: Information Input	
1. Perceptual interpretation	Interpreting what is sensed
2. Input from representational sources	Using various sources of information
3. Visual input from devices/materials	Watching devices/materials for information
4. Evaluating/judging sensory input	Evaluating/judging what is sensed
5. Environmental awareness	Being aware of environmental conditions
6. Use of various senses	Using various senses
Division 2: Mental Processes	
7. Decision making	Making decisions
8. Information processing	Processing information
Division 3: Work Output	
9. Using machines/tools/equipment	Using machines/tools/equipment
10. General body vs. sedentary activities	Performing act. requiring gen. body move
11. Control and related physical coordination	Controlling machines/processes
12. Skilled/technical activities	Performing Skilled/technical activities
13. Controlled manual/related activities	Performing Controlled manual/related activities
14. Use of miscellaneous equipment/devices	Using miscellaneous equipment/devices
15. Handling/manipulating/related activities	Performing handling/related manual act
16. Physical coordination	General physical coordination
Division 4: Relationships With Other Persons	
17. Interchange of judgmental/related information	Communicating judgments/related info
18. General personal contact	Engaging in general personal contacts
19. Supervisory/coordination/related activities	Perf. Supervisory/coordination/related act
20. Job-related communications	Exchanging job-related information
21. Public/related personal contacts	Public/related personal contacts
Division 5: Job Context	
22. Potentially stressful/unpleasant environment	Being in a stressful/unpleasant environment
23. Personally demanding situations	Engaging in personally demanding situations
24. Potentially hazardous job situations	Being in hazardous job situations
Division 6: Other Job Characteristics	
25. Non-typical vs. typical work schedule	Working non-typical vs. typical work schedule
26. Business like situations	Working in business like situations
27. Optional vs. specified apparel	Wearing optional vs. specified apparel

28. Variable vs. salary compensation	Being paid on a variable vs. salary compen.
29. Regular vs. irregular work schedule	Working Regular vs. irregular work schedule
30. Job demanding responsibilities	Working under job-demanding circumstances
31. Structured vs. unstructured job act.	Performing structured vs. unstructured work
32. Vigilant/discriminating work act.	Being alert to changing conditions

OVERALL DIMENSIONS

33. Decision/comm/general responsibilities	Having dec/comm and general respon.
34. Machine/equipment operation	Operating machines/equipment
35. Clerical/related activities	Performing clerical/related activities
36. Technical/related activities	Performing technical/related activities
37. Service/related activities	Performing service/related activities
38. Regular day schedule vs. other work sch.	Working regular day vs. other work schedule
39. Routine/repetitive work activities	Performing routine/repetitive activities
40. Environmental awareness	Being aware of work environment
41. General physical activities	Engaging in physical activities
42. Supervising/coordinating other personnel	Supervising/coordinating other personnel
43. Public/customer/related contact act.	Public/customer/related contact act.
44. Unpleasant/hazardous/demanding environ.	Working in a hazardous/demanding environ
45. Non-typical schedule/optional apparel style	Having a Non-typical sche/optional apparel