Reviewing the OHS consequences of Motorcycle Separate Bundle Delivery

Final Report

to the

CEPU

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Table of Contents

ABBREVIATIONS 3
ACKNOWLEDGMENTS 3
EXECUTIVE SUMMARY 4
Organisational issues 4
Working environment issues 5
Equipment issues 6
Recommendations 6
INTRODUCTION 9
1.1 Reason for the project 9
1.2 Project objectives 9
1.3 Project team 9
1.4 Contents of this report 9
METHOD 11
2.1 Step 1 Analyse material provided by CEPU 11
2.2 Step 2 Examine the equipment and observe the trials 11
2.3 Step 3 Consult over preliminary findings 12
2.4 Step 4 Prepare a briefing on the preliminary findings 12
2.5 Step 5 Prepare a project report 12
ORGANISATIONAL ISSUES 13
3.1 Organisational systems 13
3.2 Work systems 14
3.3 MODAPTS Work Study Analysis 15
3.4 Work procedures 23
3.5 Workload assessment 26
WORKING ENVIRONMENT ISSUES 28
4.1 Indoor work 28
4.2 Outdoor work 28
4.3 Assessing the risks from manual tasks 29
EQUIPMENT ISSUES 39
5.1 Introduction 39
5.2 Anthropometric data 39
5.3 Motorcycle 48
5.4 Bag design 48
5.5 Panniers 52
CONCLUSION AND RECOMMENDATIONS 53
Organisational issues 53
Working environment issues 54
Equipment issues 54
Recommendations 55
APPENDIX 1: DATA RECORDING WORKSHEET 58
APPENDIX 2: RISK ASSESSMENT USING THE NATIONAL CODE OF PRACTICE FOR THE PREVENTION OF MUSCULOSKELETAL DISORDERS FROM PERFORMING MANUAL TASKS AT WORK 64
APPENDIX 3: ANTHROPOMETRIC DATA OF THE PARTICIPANTS 71

Abbreviations

AP	Australia Post
CEPU	Communications, Electrical and Plumbing Union (Postal Division)
DC	Distribution Centre
DDT	Dedicated delivery trial
DODO	Delivery Only Delivery Officer
FDD	Future Delivery Design
FLC	Front Letter Carrier
HSR	Health and Safety Representative
MSD	Musculo-Skeletal Disorders
OHS	Occupational Health and Safety
PDO	Postal Delivery Officer
PPE	Personal Protective Equipment
SBD	Separate Bundle Delivery

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We would like to thank all of the Australia Post staff and managers who freely and enthusiastically discussed their work with us.

Photographs reproduced in this report were taken with permission by Andrea Shaw and Philip Meyer while observing PDOs on their rounds.

Executive Summary

This draft report details the findings and recommendations of Shaw Idea's review of the OHS consequences of motorcycle separate bundle delivery (SBD), commissioned by the Postal Division of the Communications, Electrical and Plumbing Union (CEPU).

The purpose of the assignment was to review and advise on any potential OHS consequences of Australia Post's planned change from single bundle delivery to SBD.

In particular, the review was directed to address:

- The designs and modifications proposed to the delivery vehicle (motorcycle) and the front letter carrier (bag) and their suitability for SBD;
- The work organisation issues such as the structure, scheduling and workload associated with delivery rounds using SBD;
- The work environment issues, such as topography, temperature and weather; and
- Procedures and practices proposed to be applied with SBD.

The project was undertaken by three researchers, led by Shaw Idea Pty Ltd:

- Andrea Shaw (Shaw Idea Pty Ltd) as project leader;
- Philip Meyer; and
- Dr Rwth Stuckey.

To conduct the project, we used a five stage investigation process:

- Step 1 Analyse material provided by CEPU
- Step 2 Examine the equipment and observe the trials
- Step 3 Consult with relevant CEPU members and Australia Post staff
- Step 4 Prepare a briefing on the preliminary findings
- Step 5 Prepare a project report

From this process, we conclude that the currently proposed system for SBD from a motorcycle is unacceptable from OHS and ergonomics perspectives for the following reasons:

Organisational issues

- The proposed work system increases the likelihood that PDOs will work for long periods without breaks in an uncontrolled environment. We were unable to determine if any alternative methods of merging mail had been investigated. It seems that

SBD has been adopted without investigating any other ways of improving the efficiency and safety of the merging process.

- The cognitive demands are self-evidently increased (over single bundle delivery) as there are two reading tasks to perform per delivery point, and the sighting points are separated and may be in different orientations, requiring addresses to be read upside down. The frequency of mis-sorts also increases cognitive load.
- AP has not identified any adequate risk controls to prevent reading and riding other than administrative controls, (the weakest form of risk control), which are not able to be enforced except by surveillance of the PDOs. This practice is not only objectionable on many grounds, but is also inefficient and unproductive, requiring considerable resources for little net gain in risk control. It could be argued that the practice of surveillance increases risk because of adverse effects on psychosocial risk.
- Apart from administrative controls (SOPs, etc), AP does not have any acceptable form of management or work design to prevent PDOs having to perform long spells of continuous delivery work with insufficient breaks, this being necessary in order to meet delivery time requirements.
- The methods for determining the size, and therefore the duration, of rounds do not appear to be adaptable to the realities of the work demands. Accordingly, a previous recommendation that rounds be a maximum of five hours in duration is routinely exceeded. No allowance appears to have been made for the increased cognitive demands and the concomitant increase in time spent in delivery that SBD incurs.
- The design of the work system for SBD does not take account of contemporary expectations for a compatible work-life balance, particularly when there is inconsistency in what part of the day is occupied by work, and what part of the day is non-work. This is of particular importance to PDOs who are parents, carers, etc. There does not appear to be a coherent job description for the duties of a PDO engaged in SBD, defining the allowances and requirements for a properly structured shift of work, including the periods of work for each activity, the breaks to be taken, and providing for the work to be performed in well-managed work circumstances.

Working environment issues

- There is a known high incidence of traffic accidents involving these motorcycles in delivery work (as noted in the MUARC report). Any work process that increases the time of exposure to this risk necessarily increases OHS risk unless measures to control the risk of traffic accidents at their source are also implemented. SBD causes PDOs to be exposed to peak hour traffic, on roads, footpaths and across domestic driveways, in the mornings and, for some, in the afternoons also.

- Ergonomics analysis indicates that the task involves unacceptable work postures and upper limb actions that are identified as risk factors in the *National Code of Practice for the Prevention of Musculoskeletal Disorders from Performing Manual Tasks at Work.*

Equipment issues

- A previous study (by two of the researchers in this study) concluded that the use of motorcycles in mail delivery has an elevated level of hazard particularly when delivering in terrain that is hilly and on surfaces that are slippery and uneven. Nothing has changed since that report in respect of the design of the motorcycle or panniers.
- The motorcycles or panniers are not sufficiently adjustable to suit riders and therefore do not accord with basic ergonomics principles for the design of work equipment.
- The length of time spent on these motorcycles every day is judged to be unacceptable because the lack of adjustment will cause many PDOs to spend long periods in slumped and unsupported sitting while subject to whole body vibration (albeit at levels not yet measured but likely to be at elevated levels of risk), with expected adverse consequences for their lumbar spine, hips, and possible also shoulders and neck. Any consequences would be exacerbated by the weight of the helmet.
- The bundle sizes of 70 mm and 90 mm that are required by the design of the FLC are too large for many smaller sizes of hands. (It is acknowledged that these are maximum bundle sizes and many PDOs in fact select smaller bundles.)
- While the front letter carrier is simply an adaptation of the previous bag, the compartmental design imposes additional physical demands on the PDOs using it in respect of neck movements and upper limb actions.
- The weight of and heat generated by the current helmet combine to undermine the comfort and increase fatigue of PDOs, compounded by the neck posture required for the task.
- Even accepting that a consultative process was employed in the development of the SBD Front Letter Carrier, there are reasons to query the efficacy of the design process given that the starting points were probably erroneous. We are not convinced that the design activity was appropriately directed and posit that the design of the bag may be fundamentally inadequate in consequence.
- The motorcycle and its attachments are not adequately developed as they should be for this type of work. While we acknowledge that AP must comply with the directives of the Administrator of the Motor Vehicle Act, there is clearly scope to negotiate an effective compromise that meets the needs of both the ADRs and OHS requirements for the work of PDOs.

Recommendations

1. As much of the PDO's work as possible should be undertaken in a well-designed, managed work environment. Outdoor work requires the availability of shelter, ready access to facilities such as toilets, and a place to take a break from work. Indoor work requires sorting tables and V-Frames which are well-designed and adjustable for individual needs. Any changes should be justified on the basis of *improvement* to the working environment and *decrease* in OHS risk. The current proposal for SBD represents the opposite: a *deterioration* to the working environment because it increases time spent in an uncontrolled environment which presents many unpredictable and potential high risk hazards and an *increase* in risk of developing MSD.

2. Modification of any aspect of PDO work must consider **all** aspects of their work system in a coherent manner. The design process for the SBD FLC has been characterized by a great deal of consultation (for which we commend AP) but not a lot of effective outcomes as it has only focussed on one aspect of the work system, bag design. We have previously mentioned work-life balance which is a component of this issue.

3. The timing of deliveries should consider the road traffic patterns, particularly domestic and driveway traffic. Deliveries should be undertaken at the times when exposure to the risks relating to traffic and roads, pathways and driveways are the lowest possible.

4. Round times should be set realistically at times calculated using experienced operators doing the work in the safest manner possible, including appropriate pathways speeds, having time to stop and read, and allowing for adequate breaks. Appropriate times must also be considered for relievers and operators undertaking unfamiliar splits who will need more time to complete unfamiliar rounds.

5. While many PDOs reported enjoying working on the bike and the outdoor component of the work, the amount of time working on the bike should be limited as per the discussion in the 2004 DDT report.

6. All rounds must provide facilities for shelter, food and toileting, and allow time for appropriate breaks.

7. The physical and cognitive demands of the task should be reduced wherever possible either by redesigning delivery equipment and environmental aspects of the tasks as discussed in the recommendations above, or reducing the exposure to the tasks by reducing the amount of time spent on the bikes.

8. The recommendations made in the earlier report regarding bike design provided as part of the DDT remain relevant. These should be reconsidered and implemented. While mail could be delivered in accordance with OHS and ergonomics requirements while using powered conveyances, the specific

design characteristics of the conveyance are critical considering the specific environments in which it is to operate. The motorcycles in current use are not acceptable and their use should not continue in their present form. We note that AP is already considering alternative modes of delivery and the motorcycles are being supplemented by these alternatives. We are aware of other possible conveyances being considered by AP but have not been briefed on any evaluation work that has been undertaken to date. The allocation of any type of conveyance for the carriage of the mail (and the PDO, where appropriate) must be determined specifically on the basis of practicality and safety.

9. The FLC needs to be substantially redesigned in order to accord with ergonomics principles for good work posture and safe manual handling. The FLC bag should be redesigned so that the sequenced mail and the residue mail are both contained in a way that allows all of the addresses to be visible within a comfortable line of sight of the PDO without having to bend their neck excessively, as is currently the case. Both bundles of mail should be handled with movements that are in the same plane, unlike the current bag where the hands move in (nearly) opposite directions. The residue mail needs to be positioned so that the current variability of the placement of addresses is accommodated and all addresses are displayed right-way-up. (We are aware of the ongoing and iterative development of the FLC but even the latest iteration of the design – sighted 24.11.10 – simply continues the deficiencies of the current bag design).

10. The motorcycle may require further development in order to accommodate SBD in a properly ergonomic manner. We anticipate that the speedometer may need to be raised to allow the FLC to be positioned higher. We also re-iterate the findings of the 2004 report on Dedicated Delivery that argued for changes to the panniers. As all changes must be agreed by the Administrator of the Motor Vehicle Act, AP could use the findings of this and previous reports as a basis for asserting the need for change.

11. The panniers should be redesigned (as per the recommendations in the earlier DDT report) so that they are mounted closer to the PDO to reduce reach distances. The panniers should also be partitioned to control the bundles which presently are not confined within the bag and tend to fall loosely within the bag (in making this recommendation, we are aware of the safety issues pertaining to balancing the loads on the motorcycle).

12. The helmet, which must be worn during bike use regardless of whether this is on-road or on footpaths, should be the lightest possible weight (within safety standard requirements) with optimum ventilation.

1 Introduction

This draft report details the findings and recommendations of Shaw Idea's review of the OHS consequences of motorcycle separate bundle delivery (SBD), commissioned by the Postal Division of the Communications, Electrical and Plumbing Union (CEPU).

1.1 Reason for the project

The CEPU initiated this project due to their concerns about the potential health and safety (OHS) consequences of Motorcycle SBD that was being promoted and developed by the Future Delivery Design (FDD) section of Australia Post (AP).

1.2 Project objectives

The purpose of the assignment was to review and advise on any potential OHS consequences of Australia Post's planned change from single bundle delivery to SBD.

In particular, the review was directed to address:

- The designs and modifications proposed to the delivery vehicle (motorcycle) and the front letter carrier (bag) and their suitability for SBD;
- The work organisation issues such as the structure, scheduling and workload associated with delivery rounds using SBD;
- The work environment issues, such as topography, temperature and weather; and
- Procedures and practices proposed to be applied with SBD.

1.3 Project team

The project was undertaken by three researchers, led by Shaw Idea Pty Ltd:

- Andrea Shaw (Shaw Idea Pty Ltd) as project leader;
- Philip Meyer; and
- Dr Rwth Stuckey.

1.4 Contents of this report

This report is in six (6) sections as follows:

Section 1	Introduction.
Section 2	Method: describing the method that was used to undertake the project.
Section 3	Organisational issues: setting out our findings in relation to the organisational issues arising from SBD.
Section 4	Working environment issues: setting out our findings in relation to the working environment issues arising from SBD.

Section 5	Equipment issues: setting out our findings in relation to the equipment issues arising from SBD.
Section 6	Conclusion and recommendations: providing our conclusions from the review and our recommendations for dealing with the OHS consequences we have identified.

Three appendices provide background information referred to in this report.

2 Method

We used a five (5) stage research process:

2.1 Step 1 Analyse material provided by CEPU

An internal reference group was established by the CEPU to guide the work, consisting of key officials in the relevant branches. A meeting was held with this group to discuss the key issues they identified with the proposed change to delivery method and the method we planned to use in the review. We also met with key personnel involved in FDD from Australia Post. At this stage, we also reviewed a range of information provided by CEPU and Australia Post, including the MUARC report which arose out of Australia Post's previous Enforceable Undertaking.

2.2 Step 2 Examine the equipment and observe the trials

Through coordination with the CEPU and relevant Australia Post employees, the consultants examined the equipment proposed to be used in SBD, most particularly the motorcycles and the modified front letter carriers (FLC). The implications of the changes to the sorting work were also examined. Semi-structured interviews with as many of the Postal Delivery Officers (PDOs) engaged in the SBD trial as possible were undertaken, and observations made of the delivery method in progress. These interviews and observations took place at all of the locations that were engaged in the trials. The site data collection and interview guide is provided as Appendix 1.

We interviewed and collected data from 49 individuals at six locations: two in Melbourne, two in Brisbane and two in Sydney. Of these 49 PDOs involved in the trial:

- Seven were relieving PDOs and one was a team leader.
- 46 were men
- They had an average of 8.94 years of service in AP
- They had an average of 7.62 years delivering on an AP motorbike
- 39 (80%) were full time
- 41 were right-handed.

The interviews were distributed across the locations as follows:

- NSW
  - Seven Hills – 6
  - Lakemba – 15

- Queensland
  - Heathwood – 6
  - Ashfield – 4
- Victoria
  - Waverley – 12
  - Seaford - 6

2.3 Step 3 Consult over preliminary findings

The findings of Steps 1 and 2 were used in ongoing consultation with CEPU members and Australia Post staff. Further data was collected to inform the review and particularly the risk control strategies used by Australia Post in support of the change.

2.4 Step 4 Prepare a briefing on the preliminary findings

A briefing was conducted for CEPU officials, outlining the findings of the study, to allow opportunity for discussion and clarification.

Our findings have been analysed to examine OHS issues at three levels:

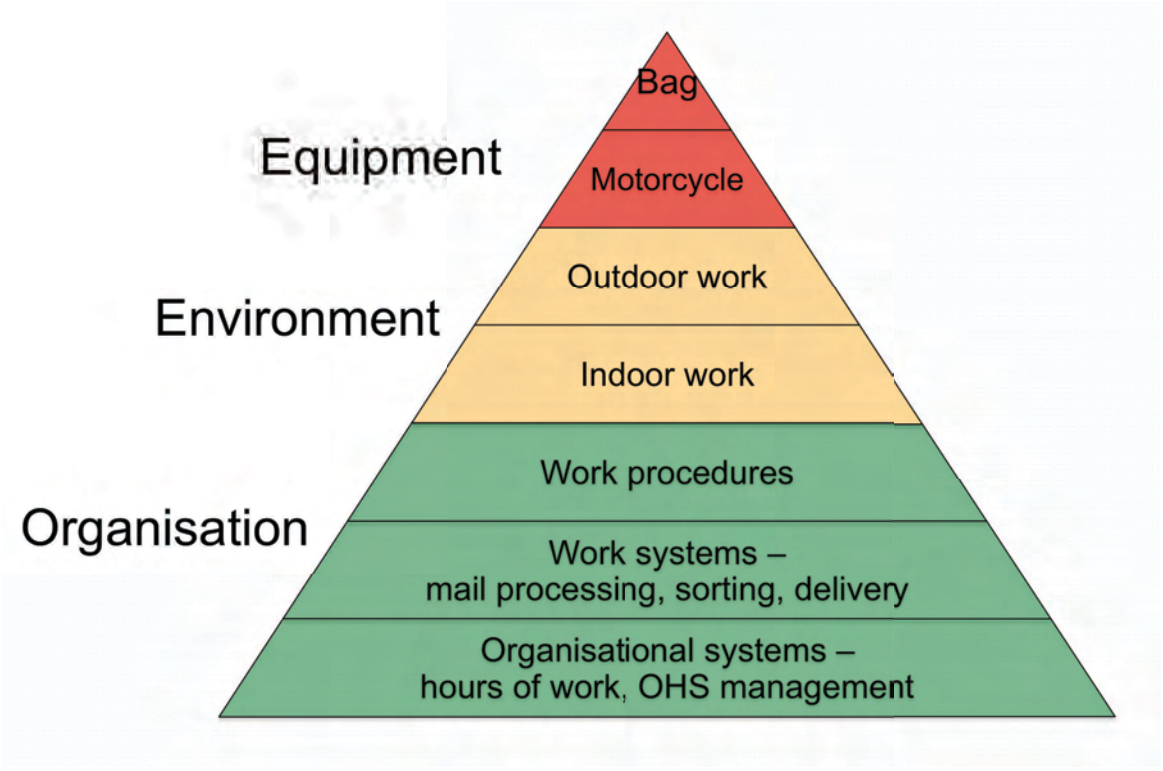

Figure 1: Levels of analysis

2.5 Step 5 Prepare a project report

On the basis of the feedback from the CEPU, the consultants have prepared this report detailing the findings and recommendations.

3 Organisational issues

Organisational issues that arise from the proposed SBD system result from impacts of the proposed changes on organisational systems, work systems and work procedures.

3.1 Organisational systems

Organisational systems of most relevance to SBD are hours of work and OHS management.

3.1.1 Hours of work

Existing systems of work encourage workers to skip breaks to finish early. The work design does not include prescribed breaks once delivery has commenced. The time constraints currently applied (unofficially) and the motivation to finish as early as possible combine to discourage operators to take breaks. We received numerous reports of PDOs and DODOs perceiving pressure to make haste and take short cuts in order to achieve round times that had been determined by AP. We were told that this pressure and opportunity to skip breaks is exacerbated by the proposed SBD system because PDOs spend even more time in delivery and the defined round times are not based on evidence. This is a particular characteristic of the full time employment conditions for PDOs, but also affect DODOs who may experience even greater incentive to make haste to finish early. Such systems may increase the risk of OOS, fatigue, and traffic accidents.

3.1.2 OHS management

The material provided by AP describing the OHS management of SBD embodies an OHS system that relies on administrative controls, eg standard operating procedures (SOPs) and the like. Enforcement of these through a behaviour observation program is relied upon as the key control measure. We saw AP's program in operation at several sites. OHS legislation has been consistently interpreted by the courts to require employers to seek to eliminate risk and to control risks at their source. Such an approach is not evident in OHS considerations for this project so far. This is a particular issue for the OHS consequences of SBD because the existing approach to OHS management is not adequate to deal with the organisational, working environment and equipment design issues that we have identified with SBD.

One key example of this is the practice of reading and riding that persists even with SBD. We observed a number of PDOs on the trial holding mail in one hand while riding to the next drop point, presumably because of the time pressure. Whether this is actually a problem or not is difficult to determine. All motor vehicle operators glance and ride frequently, eg when looking in the rear vision mirror, checking directions. The point at which this practice becomes dangerous will vary.

The only control we are aware of that has been identified by AP has been greater enforcement of SOPs through surveillance of the PDOs, instead of investigating the underlying causes of reading and riding that may be related to design of rounds and round times. Surveillance of PDOs is not only objectionable on many grounds, but is also inefficient and unproductive, requiring considerable resources for little net gain in risk control. Surveillance may in fact increase risk because of adverse effects on psychosocial risk.

3.2 Work systems

The systems of work that have been developed to allow SBD increase OHS risk as a result of increasing cognitive load, ambiguity in determining round design and duration, the timing of delivery and lack of access to facilities while on the round

3.2.1 Increasing cognitive load

As well as increasing cognitive load in delivery as a result of work procedures (discussed below), the use of machine-sequencing for DL sized mail increases the cognitive load involved in delivery because miss-sorts in sequenced mail are not evident until the point of delivery. With single bundle delivery, miss-sorts in the sequenced mail are evident when throwing off the mail at the DC. The extent to which this occurs cannot be precisely defined. PDOs reported that miss-sorts were very common and we certainly observed numerous examples. The SOP instructs PDOs to return miss-sorts to the Distribution Centre (DC) for next day delivery. Most PDOs we interviewed were reluctant to do this, taking great pride in delivering mail as promptly as possible to customers on their round. Instead, they would return to the delivery point for the miss-sorted item to ensure that customers got their mail on the day it arrived at the DC. Given the importance of job satisfaction for reducing psychosocial risk, work instructions that reduce pride in work performance are likely to increase frustration rather than reduce risk.

3.2.2 Round design and duration

Reliable empirical data about round durations required to undertake single bundle delivery are not available. As a result, determining the changes in the design of rounds and the definitions of round durations for SBD is problematic. Determining round duration empirically is likely to be difficult as PDOs report being pressured to finish within an apparently arbitrarily determined time which only encourages speeding and possible neglect of safety instructions. Below, we have attempted to show that the use of work study methods may be beneficial as a starting point but we also observe that AP should seek to accurately time actual performance rather than hypothetical performance. This will require action to ensure that the timing is realistic and not influenced by confounders.

The MODAPTS analysis we have conducted and reported below clearly demonstrates that round times are inadequate and require reconsideration based on actual time required to stop and read safely if this mode of delivery is adopted. This applies both to PDO's and DODO's, both groups being currently disadvantaged

by timing expectations, although the impact varies between the two groups with the differences in pay and break structures.

3.2.3 Time of delivery

Previously identified risks associated with motorbike delivery – the use of a vehicle designed to be used on roads, being used on pathways – continue with current practice. These risks are well recognised by all involved and unfortunately have been realised many times resulting in injury and death. With the reduction in the time required for the indoor component of the work, the time of day during which most PDO's in the trial (and to a lesser extent the DODO's) begin the on-road component is earlier than previously and as such exposes them to busier road and pedestrian traffic and increased driveway use. They are also exposed for longer periods – in some cases it was reported that more than 5 hours of the working day was spent on the bike.

3.2.4 Access to facilities on rounds

Breaks, toilet stops and other welfare considerations do not appear to have been considered in the design of the rounds. These are required as components of a safe place of work under OHS legislation, contributing to fulfilling the duty of care. The lack of break opportunities and encouragement to skip breaks is reinforced by the absence of any facilities being provided for PDOs to have breaks away from the motorcycle.

3.3 MODAPTS Work Study Analysis

The word MODAPTS is an acronym made up from MODular Arrangement of Predetermined Time Standards, the underlined letters making up the name. MODAPTS was developed by an Australian Industrial Engineer, Heyde, in the 1960s in response to what he saw as a need for a work study method that better reflected the ergonomics aspects of human performance, rather than the merely industrial aspects.

MODAPTS is like other work study methods in that it assigns standardized measures of time to all the actions that the person makes in the performance of their work. The methodology requires observation of the work, often involving use of video and other recording techniques, then the analysis of the various actions and processes, and finally, the preparation of a Time Standard for each discrete task. The last stage of the process is important and is particularly pertinent to this study of SBD because it requires that the MODAPTS practitioner to compare the time determined by the MODAPTS analysis with the actual time taken by the worker. The significance of this is that what people do in the way of work performance is really the true measure of the time needed for performance of the task. This challenges the notion that workers are unreliable (if not actually dishonest) and will never give a true rendering of their work performance, whereas reliable studies of people at work have always shown that competent workers are incapable of slowing down just to trick the stopwatch. Work performance becomes a matter of skill that is difficult to manipulate.

This work study covers handling individual letters from the Front Letter Carrier (FLC) into the letterbox.

The study excludes:

- Dead riding to start the round.
- Riding within the round, i.e. from drop point to drop point, including the small manoeuvrings and other adjustments the PDOs make to clear obstructions, slippery ground, etc.
- Allowances for rest breaks – an allowance of at least 10% is usually included in MODAPTS times to account for unavoidable unproductive time, toilet breaks, activity rest pauses, etc.
- Getting multiple letters for one address.
- Getting a mix of sequenced, residue and UMS and placing in letterboxes.
- Writing out the docket for registered mail and delivering same.
- Posting in non-optimal letterboxes.
- Locating and/or reading non-optimally presented addresses.
- Handling letters that are slippery or too flexible to grip and manipulate easily.
- Missorts and the time to check, and put the letter in the grey box.
- Getting new bundles from the panniers.
- Reloading with mail from depot boxes.
- Other unaccounted administrative actions.

Thus, the timings given below significantly understate the time involved in doing the whole job. This underestimate is likely to be even more significant for SBD since several of these confounders are more common or have greater impact in SBD, eg miss-sorts and addresses that are difficult to read because they are upside down.

These analyses are thus necessarily limited in their scope but they do provide some useful information to guide future discussion about the timing of the work.

3.3.1 Single bundle delivery – indicative analysis

Analyses A, B, C, and D refer to Single Bundle Delivery.

Handling DL envelopes

The first analysis considers posting a single DL sized letter with a clear, machine-printed address. The reading time assumes a simple address with not more than 3 numerals and a short and uncomplicated street name. It is assumed for the purposes of this analysis that the letterbox is close (within 30-40 cm from the body) and it has a large, clear letter slot (not often the case). The analysis starts from the moment the motorcycle is stopped, with the PDO's hands still on the handgrips.

Example A

SINGLE BUNDLE DELIVERY

Analysis 1: Get one DL letter in a merged bundle (single bundle bag) and put to the letterbox.

Action	Code	Frequ-ency	Mods units
1. Move L & R hands from handgrips to bag	M3G0P0	1	Time not counted as this action is simultaneous with action 2
2. Sight and read address on 1st letter (simultaneous with action 1)	E2R3R2	1	7
3. Flip 1st letter and put to one hand (to reveal 2nd letter)	M1G0P0	1	1
4. Read address on 2nd letter	R3R2	1	5
5. Put letter to letterbox	M4G0P2	1	6
6. Arms return to handgrip for next ride	M4G0P0	1	4
	TOTAL		23

Total MODS units = 23

Convert to normal seconds = 2.967 seconds.

With 15% rest allowance = 3.412 seconds.

NB. This time refers to a mail drop in ideal conditions but considered in the context of actual postal work would very likely only apply to a minority of instances.

If the letterbox is at an extended reach, i.e. beyond that which can be reached with a simple rotation of the arm about the centreline of the humerus and greater than 40 cm from the body, the time for action 6 will increase accordingly because the PDO must lean sideways to reach the letterbox.

Thus (from action 5 in previous table):

Example B

From action 4 above in example A			
5. Put letter to letterbox	M7G0P2	1	9
6. Arms return to handgrip for next ride	M7G0P0	1	7
	TOTAL		29

Total MODS units = 29

Convert to normal seconds = 3.741 seconds.

With 15% rest allowance = 4.302 seconds.

This time is more likely to represent typical conditions of delivery.

If the letter slot is small, difficult to sight, difficult to target with the letter (angle of approach), or it is difficult to insert the letter because of obstructions or for other reasons, then the above time will increase accordingly.

Now that the address on the letter for the next drop point has been read it is likely to be retained for the next delivery point. Although the PDO will only glance at that address, the same allowance of time is counted as it will be a similar reading time as for the address of the first letter as the code refers to eye fixation and word recognition.

PDO rides to the next drop point and stops the motorcycle.

To post (say) 1200 single DL-size letters in optimal circumstances (as above in example A) would require 68.240 minutes.

To post (say) 1200 single DL-size letters in the more probable circumstances (as above in example B) would require 86.040 minutes.

To get more than one letter from the bag for the same drop point would entail the following, proceeding from the previous action 5. Assume example B conditions for posting.

Example C

SINGLE BUNDLE DELIVERY

Analysis 2: Get two (or more) DL letters from a merged bundle (single bundle bag) and put to the letterbox

ACTION	CODE	FREQU-ENCY	MODS UNITS
1. Move L & R hands from handgrips to bag	M3G0P0	1	3

SINGLE BUNDLE DELIVERY

Analysis 2: Get two (or more) DL letters from a merged bundle (single bundle bag) and put to the letterbox

ACTION	CODE	FREQU-ENCY	MODS UNITS
2. Sight address on first presenting letter (simultaneous with action 1)	E2	1	Time not counted as this action is simultaneous with action 1
3. Read address	R3R2	1	5
4. Flip 1st letter to reveal 2nd letter	M1G0P0	1	1
5. Read address on 2nd letter	R3R2	1	5
6. Flip 2nd letter to reveal 3rd (etc) letter.	M1G0P0	1	1
7. Read address on 3rd letter. *If not the same address....go to action 8*	R3R2	1	5
Actions 6 and 7 are repeated for as many letters as are addressed to the same drop point.			
8. Put 1st and 2nd letters to left hand	M2G0P0	1	2
9. Put all letters to letterbox (post)	M7G0P2	1	9
10. Arms return to handgrips for next ride	M7G0P0	1	7
		TOTAL	38

Total MODS units = 38

Convert to normal seconds = 4.902 seconds.

With 15% rest allowance = 5.637 seconds.

Each additional letter requires a minimum of 1.186 seconds to read, process, and handle, depending on whether the whole address is read. This reading time will increase if the address is complicated, such as if it has a unit and a street number, e.g. 1/523.

Handling DL and other sizes of envelopes

Because the Single Bundle Delivery bag contains all of the sizes and types of mail together, continuously sequenced, i.e. all the mail for each address is 'bundled' together (but whether or not it is physically bundled is of no consequence here).

Example D

SINGLE BUNDLE DELIVERY

Analysis 3: Get one DL letter and one A4 letter from a merged bundle (single bundle bag), fold the DL letter inside the A4 letter and put to the letterbox

ACTION	CODE	FREQU-ENCY	MODS UNITS
1. Move L & R hands from handgrips to bag	M3G0P0	1	3
2. Sight address on first presenting letter (simultaneous with action 1)	E2	1	Time not counted as this action is simultaneous with action 1
3. Read address	R3R2	1	5
4. Flip 1st letter to reveal 2nd letter	M1G0P0	1	1
5. Read address on 2nd letter	R3R2	1	5
6. Flip 2nd letter to reveal 3rd (etc) letter.	M1G0P0	1	1
7. Read address on 3rd letter. *If not the same address....go to action 8*	R3R2	1	5
Actions 6 and 7 are repeated for as many letters as are addressed to the same drop point.			
8. Put 1st and 2nd letters to left hand	M2G0P0	1	2
9. Fold DL letter inside A4 letter	M2G0P0	1	2
10. Put all letters to letterbox (post)	M7G0P2	1	9
11. Arms return to handgrips for next ride	M7G0P0	1	7
		TOTAL	40

Total MODS units = 40

Convert to normal seconds = 5.160 seconds.

With 15% rest allowance = 5.934 seconds.

3.3.2 Separate bundle delivery – indicative analysis

The time for getting sequenced mail from the sequenced letter insert (SLI) in SBD is essentially the same as getting items from the single bundle delivery bag.

For the purposes of this analysis it has been assumed that the address on the A4-size envelope in the residue mail compartment (RMC) is visible without having to move the envelope in order to sight the address and that it does not have to be read upside down.

A letterbox at a slightly extended arm reach but with a clear line of sight to an adequately sized slot is assumed (as per example B).

Example E

SEPARATE BUNDLE DELIVERY

Analysis 4: Get 1 sequenced (DL) letter and 1 A4 letter (residue mail) from SBD bag, fold DL letter inside A4 letter and put to letterbox.

ACTION	CODE	FREQU-ENCY	MODS UNITS
1. Move L & R hands from handgrips to bag	M3G0P0	1	3
2. Sight address on 1st letter (simultaneous with action 1)	E2	1	Time not counted as this action is simultaneous with action 1
3. Read address	R3R2	1	5
4. Flip 1st letter forward (to reveal 2nd letter).	M1G0P0	1	1
5. Read address on 2nd letter	R3R2	1	5
6. Put 1st letter to left hand	M2G0P0	1	2
7. Move hand (with 1st letter) to front of RMC and pull front panel forward.	M3G0P2	1	5
8. Move other hand to bottom compartment and get front edge of letter	M3G3P0	1	6
9. Move letter from compartment and put to left hand (holding 1st (DL) letter)	M3G0P0	1	3
10. Read address on 2nd letter. *If not the same address....*	R3R2	1	5
11. Fold A4 envelope over to fit letterbox (as required)	M2G0P0	1	2
12. Put letters to letterbox and post	M7G0P5	1	12
13. Arms return to handgrips for next ride	M7G0P0	1	7
	TOTAL		56

Total MODS units = 56

Convert to normal seconds = 7.224 seconds.

With 15% rest allowance = 8.307 seconds.

This analysis assumes that the A4 letter must be folded to fit the letterbox slot which from our observation is the usual action. It also assumes that fitting the folded A4 letter requires a little more care and targeting than a single small letter, so an additional allowance of time is afforded.

3.3.3 Differences between times to post letters using single bundle and separate bundle methods.

Assuming probable posting circumstances (example B).

Letter size(s) and combinations	Single bundle delivery method	Separate bundle delivery method	Time difference
First DL letter	4.302 secs	4.302 secs	Same time
1st and 2nd DL letter together	6.081 secs	6.081 secs	Same time
One DL and one A4 together	5.934 secs	8.307 secs	SBD + 2.373

To deliver 1 x DL letter plus 1 x A4 letter to 1200 delivery points:

Single bundle delivery = 118.68 minutes

Separate Bundle Delivery = 166.140 minutes.

Difference = 47.46 minutes

It is acknowledged that the above combination does not apply at every delivery point, so the times are purely indicative even though this is a relatively simple combination of items and requires less time than more awkward items, or other kinds of mail such as UMS. It is certainly a considerable under-estimate of the time involved in delivering under SBD because of the confounding issues specified earlier. The analysis establishes that SBD increases PDO's exposure to the high risk environment of delivery since the time spent in delivery increases unless round size is decreased to allow for this.

3.3.4 Discussion

The above analyses are accurate for the tasks being considered even though they represent only a small part of the overall work load of a PDO. They also demonstrate that the outdoor component of SBD must take a minimum of 40% longer than single bundle delivery unless risky haste and short cuts are used.

While these limited analyses may appear to have little useful application to resolving the question of the most accurate way of determining the time required to complete a mail round, they can provide a useful starting point. However, the following interpretation can be helpful.

1 Work study can only be applied to tasks that are repeated and consistent – not much of mail delivery work falls into this

category so only a small part of mail sorting and delivery is amenable to work study analysis.

2 Because of the variations between rounds, and the variations within rounds, precise timing of the whole of any round using work study methods would produce results that would be at best unreliable and at worst incorrect.

3 Accordingly, the analyses in this document provide only an indication of what would be the bare minimum time required to delivery mail, but only if all delivery points were consistent and the mail variations were as described, again not usual for mail delivery. We could attempt to calculate times for all the possible variations but this is unlikely to reveal much more than the analyses already indicate, and it is not possible to accurately time the handling of difficult items such as some of the UMS or other items that do not handle consistently.

4 Nonetheless, by knowing the absolute minimum time for mail delivery in optimal circumstances, the conclusion could be drawn that:-

   a. Because the minimum work time as can be calculated by work study tools such as MODAPTS represents only a small part of the actual time required to deliver mail, and

   b. in order to accurately establish the time required for the rest of the tasks within the work to deliver mail which are not amenable to work study, and

   c. In the absence of any other properly predictive method (and not just a conveniently standardized guesstimate) for estimating real times to deliver mail on a complete round,

The only practical and realistic method available is to measure the time PDOs take to complete the round and accept that time as being the actual time required in order to complete the work.

This proposition is consistent with work study methodology whereby estimated times are always confirmed by reference to the actual work time as the work is performed by a skilled, fit worker.

3.4 Work procedures

Work procedures for SBD involve several differences both indoors and outdoors.

3.4.1 Throwing off

PDOs continue to throw off residue mail. Because of the design of the FLC, large envelopes, eg A4, must be thrown off upside down so that the address is still visible from underneath the sequenced mail holder. This adds to the cognitive load in both throwing off and delivery. It adds an extra decision and additional action to throwing off – PDOs must decide whether the address would be visible in the FLC and if not turn the item upside down for insertion to the frame. In delivery, PDOs must read the address

upside down, which is considerably more difficult than reading in the normal way and requires greater attention than normally.

Figure 2: Reading upside down

We undertook a MODAPTs analysis of throwing off residue mail into a V-sort frame. Our analysis assumes:

The current expectation of AP management is that 17 items per minute should be sorted into V-sort frames.

Because it is not realistic to allow for all of the reach permutations which range from side to side and directly in front, as well as high and low, a simple model of 9 movements to the front (within ≈ 60° arc) and 8 to the maximum sideways (90° from the front) has been adopted. Some sorts will be better than this combination and others will be worse, but the combination gives and indicative result. For this analysis it is assumed that the mail items being handled are easy to hold and do not have to be inverted.

THROWING OFF INTO V-SORT FRAME

Analysis: Get a bundle (handful) of mail and sort 17 items into the frame.

ACTION	CODE	FREQU-ENCY	MODS UNITS
1. Pick up (get) a bundle of mail; put to one hand.	M4G2P0	1	6
2. Sight and read first address	E2R3R2	1	7
3. Turn to maximum sideways extent of slots	M7G0P0	8	56

THROWING OFF INTO V-SORT FRAME

Analysis: Get a bundle (handful) of mail and sort 17 items into the frame.

ACTION	CODE	FREQU-ENCY	MODS UNITS
4. Sight slot in frame and read number	E2R3R2	8	56
5. Put letter to slot	M4G0P5	8	72
6. Sight and read address of next letter (simultaneously with return to start position – not necessarily the actual action but the movement time must be allowed for)	E2R3R2	8	72
7. Sight slot in frame (directly ahead, for the sake of this analysis) and read number	E2R3R2	9	63
8. Put letter to slot in front	M4G0P5	9	81
TOTAL			413

Total Mods units = 413

Convert to normal seconds = 53.277 seconds.

With 15% rest allowance = 61.268 seconds.

Although this analysis is based on a mix of straight-ahead and extreme range movements, so not an actual pattern of sorting actions, the analysis still shows that 17 items cannot be slotted within 60 seconds. This analysis also does not allow for:

- Addresses which are difficult to read;
- Determining whether the address is positioned so that the item needs to be turned upside down for insertion into the slot and the subsequent actions;
- Slots which already have mail and into which additional mail must be carefully inserted;
- Actual movement times to the less accessible slots, e.g. slots at the top or bottom of the frame;
- Slots which are blocked for mail to be redirected and the mail put aside;
- Extra reading time for slots which are not readily identified as to position; nor
- Other mail handling procedures.

Throwing off in two-module frames would require even more time and would not allow anything even approaching 17 items per minute.

3.4.2 Longer outdoors, shorter indoors

From the data we collected at the trial sites, SBD takes 0.77 minutes longer outdoors and 1.12 minutes shorter indoors. Interestingly, our empirical result is almost the same as the MODAPTS figure derived above. We believe our trial data may be an under-estimate because it was clear that a number of the PDOs we interviewed were doing their very best to reduce times, despite AP's support for taking as long as necessary to do the job properly.

3.5 Workload assessment

We assessed workload using the NASA Task Load Index (NASA-TLX), using a 5 point scale, where 5 indicated the highest level of the particular item and 1 the lowest.

3.5.1 Cognitive demand

The average score for mental demand was 3.21, slightly elevated. The range was 1 – 5, representing the entire range available.

The cognitive demands are self-evidently increased (over single bundle delivery) as there are a minimum of two reading tasks to perform per delivery point, addresses must now be read, not simply glanced at, and the sighting points are separated and may be in different orientations, requiring addresses to be read upside down. The frequency of miss-sorts also increases cognitive load. Having to deal with UMS is a further load and PDOs reported that this was more difficult with SBD, taking more time and requiring more bending and twisting to obtain UMS from the panniers.

As a result, SBD requires sustained high levels of attention and concentration by PDOs. Sustained concentration may increase mental fatigue, may reduce alertness and vigilance, and has implications for road safety.

3.5.2 Physical demand

The average score for physical demand was 3.04, in the neutral area. No respondents rated the physical demand as very low (1).

While observing the rounds we saw levels of physical work demand that workers may find difficult to maintain and a number of PDOs did complain about the pace of work necessary to avoid being chastised for taking too long on rounds. This increases the potential for fatigue, traffic accidents, errors, etc and is exacerbated by split rounds. In particular, the physical actions needed in SBD present a significant risk of MSD, as described below.

3.5.3 Time demand

The average score for being hurried or rushed was 2.69, relatively low. The range was 1 – 5, representing the entire range available. However, there were some examples of workers needing to meet tight deadlines, particularly when working split rounds additional to the regular round.

3.5.4 Effectiveness

The average score for how successful PDOS believed they had been in performing their tasks was 3.94, the highest score obtained in the TLX. No respondents rated their success as very low (1).

PDOs are obviously confident that they are achieving the required standard of work.

3.5.5 Effort

Alongside this success, PDOs reported that they had to work quite had to achieve this level of success, scoring this on average 3.42. Only one respondent reported that their effort was very low, with all other scores distributed across the entire range.

3.5.6 Frustration

PDOs did not report significant levels of frustration with the work, scoring this at 2.81. However, those sites where UMS had been delivered using SBD reported higher levels of frustration than others. PDOs also expressed concern about sudden changes in workload, or seasonal changes in volume to occur without any mechanisms for dealing with the change. Such demands would compound the work system issues described above.

4 Working environment issues

4.1 Indoor work

SBD has also introduced changes to the work processes involved in indoor work.

4.1.1 Throwing off

As described above, unrealistic times have been allowed for throwing off. The times presume that the removal of sequenced mail reduces the time required more than in reality. The times do not allow for the increased workload required in throwing off because of the extra decisions and actions required to throw off some large letters upside down. There is also an erroneous expectation that splitting round into two will not increase time needed for throwing off.

4.1.2 Timing of breaks

The timing of breaks with SBD reduces the time between breaks so that PDOs are having their lunch break prior to delivery between roughly 7 am and 8 am. This does not allow for suitable rest and nourishment throughout the working day.

4.2 Outdoor work

Outdoor work intrinsically involves greater exposure to traffic risks, which are known to be a significant risk for AP. There are frequent accidents and injuries as a result of traffic accidents involving PDOs, and SBD increases this exposure as a result of longer time being spent in delivery. Increased time in outdoor work also increases the following risks.

4.2.1 Increased time to deliver

An important aspect of this work is that it is undertaken externally, away from the formally controlled and managed AP workplace. As well as increased exposure to traffic risk, this also increases exposure to environmental conditions such as sun, wind, cold, heat etc for both PDO and the mail itself (because of the design of the FLC).

The actual delivery aspect of the work is undertaken using a powered vehicle designed for road use in pedestrian environments, where it is meant to be used at ‘walking’ speed with frequent stops, hence not used as a powered vehicle. The surfaces on which this vehicle is used are frequently less than optimal and the pathways are frequently obstructed by various objects. On one round we observed, there was a mattress lying across the footpath, and on others we frequently observed ‘wheelie bins’ obstructing access to mailboxes!

4.2.2 Risk of musculo-skeletal disorders (MSD) increased

The nature of the work done outdoors increases the risk of MSDs. As well as increased time on the bike, the SBD process requires more frequent and longer periods of neck flexion, (while wearing a helmet weighing about 2 kg); more upper limb reaches, to panniers including twisting, bending; and additional forward reaches into the FLC than previously undertaken with mail delivery. Most of

these actions require hand movements and reaches behind and away from the body. 'Stop and read' increases leg actions, balance and hand control activity. This is more of an issue for smaller operators as they are required to reach to place at least one leg on the ground each time they stop.

The actual delivery activity is designed to be undertaken using the left (and most frequently) non-dominant hand.

MSD are known to be a significant issue associated with the work of PDOs since most workers' compensation claims by PDOs relate to MSDs. The risk is known to exist of the development of both acute and gradual onset injuries. We have examined this risk using different risk assessment tools, primarily the risk assessment pro forma in the *National Code of Practice for the Prevention of Musculoskeletal Disorders from Performing Manual Tasks at Work.*

4.3 Assessing the risks from manual tasks

There are a variety of different risk assessment techniques available to assess the risk of MSDs. Conducting risk assessments is fundamental to good OHS and ergonomics practice and is required by law in relation to manual handling tasks in all jurisdictions.

4.3.1 AP risk assessments

We reviewed risk assessments that Australia Post (AP) had previously conducted of SBD, mainly of the new Front Letter Carrier (FLC). These assessments are contained in the AP document *Interim Risk Assessment of Motorcycle – Separate Bundle Delivery (SBD) Carrier (Version 3),* dated April 2010. The assessment refers to the risk potential of the FLC bag after some modifications but we observe that further modifications to the bag have been carried since the issue of this assessment. Our main criticism of this assessment is that it appears to minimize the likelihood of accident events, and most are rated as 'remotely possible' (scoring 1) whereas we would have rated many of them as 'quite possible, could happen' which is scored 6. These assessments have emphasized the potential for falls and collisions with much less emphasis on ergonomics and manual handling issues.

The assessment methods used by Australia Post FDD have been risk scoring (using values from Fine), and ManTRA.

4.3.2 Other available risk assessment tools

If additional assessment tools are required in order to expand or clarify issues raised in an assessment by use of the National Code, the Code lists a number of methods for conducting manual handling risk assessments. AP has evidently settled on ManTRA as their preferred tool for use in manual handling risk assessments. This tool is adequate in some circumstances but it is not complete and has distinct limitations for assessing SBD. (refer below).

Of the additional assessment methods listed in the Code, all were considered by the consultants and their applicability judged as

follows (discussed in the order in which they appear in the Code of Practice.)

1. **Snook tables.**
   These tables were developed for the assessment of heavier lifting tasks. They are limited to two-handed symmetrical lifting (or lowering, pushing, pulling, or carrying) in a standing posture.

   The Snook tables were judged not to be applicable to the work of mail delivery.

2. **Strain Index**
   This method is limited to rapid, repetitive hand work and is designed to assess work that is more typically factory-based. The Stain Index was judged not to be applicable to assessment of the work of mail delivery.

3. **OWAS**

   This method was developed by the Finnish steel industry for assessing tasks in steelworks where there is more whole body activity and workers are standing and working in free space. Thus the focus and application of OWAS is not pertinent to the work of PDOs working on motorcycles. OWAS was judged not to be applicable to assessment of the work of mail delivery.

4. **RULA**

   This was developed for application initially in the UK garment industry, so the orientation is a fixed location (not mobile), working at essentially the same process such as operating a sewing machine, or similar activity.

   There are factors in the work of mail delivery that do not accord with this method, including the variations in work activities, being mobile, the outdoors environment, etc. However, as an exercise, RULA was used to assess just one part of the PDO's work - the actual placement of the letters in a letterbox. The RULA assessment produced a score of 3-4 which leads to the recommendation to 'investigate further'. We note that our score of 3-4 is the same score as obtained by the LaTrobe University researchers in their report for AP. Overall, RULA could be applied to the work of mail delivery but only in a very limited manner that would not account for all of the factors involved. RULA was judged not to be applicable to assessment of the work of mail delivery.

5. **REBA**
   This is similar to RULA but considers the whole body implications of the work. Again it is not a method that was intended to be applied to mobile outdoor work and any assessment using this will be deprived of the consideration of a number of factors to do with the nature of the work.

A cursory assessment of the actions of reaching out to place letters in a letterbox generated a high score for which risk control was recommended of the basis of immediate necessity. However, REBA cannot account for the totality of the PDOs' work.

REBA was judged not to be applicable to assessment of the work of mail delivery.

6. ManTRA

This tool scores for four regions of the body (lower limbs, spine, neck/shoulder, upper limb) from the perspectives of total time spent on the work, the demands of repetition, exertion (force and speed), postural awkwardness, and vibration. These are useful aspects but ManTRA does not account for environmental factors, work organization and work control issues, specific actions such as pinch gripping, the use of PPE, or the demands of static muscle loading. Work posture is covered but only by limited criteria.

The introductory notes to ManTRA make the following points:

- ManTRA is specific to a person rather than a general population;
- It is intended for the assessment of tasks as a whole rather than individual task elements.

The use of ManTRA by Post for the assessment of two specific aspects of SBD would appear to be contrary to the intended application of the method, as would their generalizing of the assessments.

ManTRA scoring can be argued to understate the risk potential and the implications of the level of hazard. Of a maximum 25 points, ManTRA requires that a score of 15 is required before action (risk control) may be regarded as being 'indicated', although it does highlight that if exertion and awkwardness are present to a level somewhat above moderate, corrective action may also be required. ManTRA is applicable in some aspects but it is not a complete assessment tool and may therefore present a more favourable view of the work than might otherwise be presented by a more comprehensive tool. Our concern is that AP management might be lead to believe that the hazards are less significant than they really are. ManTRA may be useful for identifying manual handling problems of a more generic and obvious nature but it is not sufficiently sophisticated for the assessment of the work of the PDOs.

ManTRA appears to be have been adopted by Australia Post as their preferred risk assessment tool for assessing manual handling. The other nominated tools are:

- NIOSH Work Practices Guidelines for Manual Handling (1991).
- University of Michigan '3D and energy expenditure prediction model', more correctly known as the 3D Static Strength Prediction Program (SSPP).

Other than ManTRA, the other two mentioned methodologies are useful but are more intended for the assessment of heavier manual handling than is the case with mail delivery. We note that the Latrobe report included the use of SSPP to evaluate the loading of the lumbar spine when reaching back into the panniers. The forces were well within the safe range for males, but the authors do note that this application of the tools is not really within the intended application, the assessment of lifting tasks. In any case, this assessment only refers to the load on the lumbar spine at the point of attempting to lift the bundles, but does to assess the actual lift action which is the cause of concern for us.

Overall, we do not believe that ManTRA should be the nominated rapid assessment tool given the procedural weaknesses and generality of it.

7. UK Quick Exposure Check (QEC)

This is a very generalized overview tool that would provide little useful information.
QEC was judged not to be applicable to assessment of the work of mail delivery.

8. UK HSE Manual Handling Checklists (MAC)

A general purpose, broad-brush tool for a first scan of a job but not specific enough for a thorough and conclusive manual handling risk assessment.
MAC was judged not to be applicable to assessment of the work of mail delivery.

4.3.3 Risk Assessment according to the National Code

We have assessed the risk of MSD arising from SBD using the National Standard and Code of Practice for Manual Tasks (Appendix 2) and have identified many points where SBD increases the risk because of greater exposure, and new or extended actions. Many of the risk actions are evident throughout the work which typically occupies 4 – 5 hours, or longer. While no actions are performed continuously, they are performed frequently, many of them very frequently, over the period of work. In particular, the following risk factors are significant:

Note: The symbol > means greater than, hence >20° reads as greater than 20 degrees.

Repetitive or sustained posture, movements or forces

Bending the back forwards or sideways > 20°: Sideways bending is usual when placing mail in letterboxes and an extended reach is required. The use of the non-dominant (left) hand is typical in the work of the PDO.

Figure 3: Bending

Twisting the back ≥ 20°: Twisting is also needed to place mail in letterboxes, but particularly in replenishing from the panniers.

Figure 4: Twisting

Backward bending is done when leaning back to read addresses in the RMC (if sitting too close to front bag)

Bending the head forwards (flexion) or sideways > 20°: Neck flexion occurs every time addresses are read in the bag, particularly with residue mail. Where drop points are close together, this action may occur twice per minute or more.

Twisting the neck > 20°: This occurs at almost every delivery point, and may be sustained when filling multiple boxes, such as at blocks of flats. Is almost always done to the left side.

Reaching forwards or sideways >30 cm from the body: Most letterboxes are outside the 30 cm reach range because of the width of the motorcycle and a necessary measure of safe clearance between the letterbox (and fence) and the motorcycle, all of which causes PDO to lean sideways to post the mail.

Figure 5: Reaching sideways

Reaching behind the body: This occurs whenever reaching back to the panniers. This action occurs more frequently with SBD as the bundles are smaller, and may occur every few minutes with sequenced mail. There is potential for strains or injuries to the shoulders, elbows and wrists because the action is one-handed and half the time involves the non-dominant hand.

Figure 6: Twisting and reaching

Figure 7: Reaching behind

Standing with most of the body weight on one leg: PDOs with shorter legs will incur this when they have stopped the motorcycle but are supporting it – holding it in balance while delivering. It was noted by the LaTrobe University researchers that this one-