

**RATE FOR BUNDLING SEQUENCED
MAIL AND DELIVERY USING
SEPARATE BUNDLES.**

Australia Post

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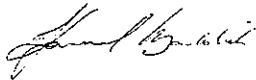
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REVIEW OF MODAPTS ASSESSMENT ON BUNDLING AND SBD

This ergonomic assessment has been prepared for Australia Post by Dynamic Injury Solutions Pty Ltd on the basis of instructions and information provided by Australia Post and therefore may be subject to qualifications that were not expressed.

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Table of Contents

Executive
Summary.....-4-

1. Aims of Study.....- 5 -

2. Background- 5 -

3. Methodology.....- 7 -

4. Results- 8 -

5. Discussion- 20 -

6. Conclusion- 21 -

7. References.....- 22 -

GLOSSARY OF TERMS.....- 23 -

EXECUTIVE SUMMARY

Review of MODAPTS assessment on bundling and delivery of mail.

Dynamic Injury Solutions Pty Ltd was requested by Australia Post to review a draft MODAPTS assessment undertaken by Australia Post for both the internal bundling operation and Separate Bundling Delivery (SBD) on motorcycles. A MODAPTS study was required to estimate a reasonable rate for the bundling of sequenced mail and provide a time variation for using SBD using MODAPTS.

MODAPTS (Modulated Assessment of Pre determined Time Standards) is a workstudy assessment methodology which can determine the normal time to perform a certain combination of movements in a normally paced manner. It includes provision for the assessment of simple decisions and reading words.

An initial meeting on March 2010 with David Nelson and Debby Freeman provided a brief of what was required. Resources provided included, risk assessment, Safe Operating Procedure (SOP), SBD Indoor / Outdoor video footage and previous MODAPTS assessments and reports.

A further meeting with Debby Freeman, Stuart Southworth and John Armitage in May 2010 assisted in defining the scope of the study. At a later date video footage which followed the SOP for bundling and delivery on a Honda CT110 Motorcycle was used to determine a rate for bundling and delivery purposes.

The methodology involved analysing the video for each assessment. This was then converted to MODAPTS which was based on an interpolation of the video results of the subjects observed. As MODAPTS is based on distance of movement rather than user population, the results can be extrapolated to all Postal Delivery Officers (PDOs).

Note: Each MOD is equivalent to 0.129 seconds.

Table 1 Summary Table of MODAPTS assessment

Task: Bundling mail in one tray (7 bundles)	MODs	Seconds no rest	Seconds with rest
Bundling using 2 elastic band	557	71.9	82.7
Bundling using 2 elastic band. (Decision)	560	72.2	83.1
Bundling using 2 elastic bands (lift of fallen mail)	566	73	84
Bundling using 2 elastic band. (Decision and lift of fallen mail)	569	73.4	84.4
Task: SBD delivery of mail (Motorcycle only)	MODs	Seconds no rest	Seconds with rest
Deliver 2 Sequenced Mail 1Residue Mail and 1 Unaddressed Mail	63	8.1	9.3
Extra Sequenced Mail (SM)	12	1.5	1.8
Extra Residue Mail (RM)	14	1.8	2.1
Extra Unaddressed Mail (UM)	9	1.2	1.4
Task: Traditional delivery of mail (Motorcycle only)	MODs	Seconds no rest	Seconds with rest
Deliver 2 SM 1RM and 1 UM	53	6.8	7.9
Extra item of mail	12	1.5	1.8
Extra UM	9	1.2	1.4
Task: Replenishment	MODs	Seconds no rest	Seconds with rest
Current method of replenishment for traditional mail bags	80	10.3	11.9
Replenishing SM Bundle	56	7.2	8.3
Replenishing RM Bundle	127	16.4	18.8

1. Aims of Study

The aim of this study is to undertake a MODAPTS assessment of:

- (i) The indoor bundling of machine sequenced mail to establish a bundling rate; and
- (ii) Outdoor delivery, at a single delivery point, for mail delivery on a Honda CT110 Motorcycle.

A report on the findings and conclusions will include:

- Indoor bundling rate of sequenced mail.
- Expected outdoor time variations by mail type and number at a single delivery point

The report was supervised by David Nelson, Corporate Injury Prevention Management Unit (CIPMU) and Stuart Southworth, SBD Project Manager, Australia Post.

2. Background

Australia Post Delivery Operations are facing a number of challenges. Mail volumes are declining whilst the number of delivery points is increasing. Machine Sequencing has helped Post overcome some of these challenges by enabling indoor operations to be re-configured.

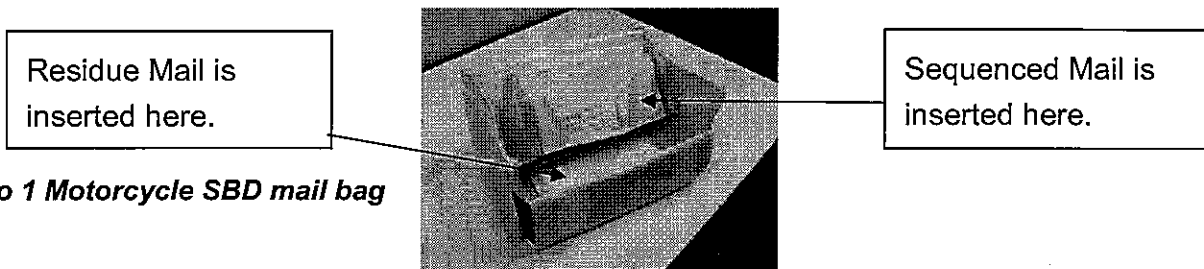


Photo 1 Motorcycle SBD mail bag

PDOs with sequenced rounds currently have to merge the residue mail with their sequenced "deck" into one bundle for delivery. Under the SBD, method of delivery, machined sequenced and residue mail streams are kept separate, forming two bundles for delivery. The PDO takes mail from each bundle and combines it at the delivery point as necessary. On average 30 percent of delivery points will have mail from the residue mail stream, with the remaining 70 percent being sequenced mail. This was supported by a SBD mail mix for an existing Mount Waverley round where the mail origin for each delivery point was documented. (Conducted by John Armitage, April 2010).

Several MODAPTS assessments have been undertaken on variations of the sequenced mail bundling method. Some of the variations include single elastic band, locating Depot Point,

writing numbers on bundles during bundling or at the end. In the case of this MODAPTS Study two scenarios were considered:

- 1) Bundling a tray of sequenced mail.
- 2) Bundling a tray of sequenced mail and if a depot point was located in the mail the bundle of mail was positioned vertically rather than horizontally within the tray.

MODAPTS has been used for many years as the standard methodology by Australia Post in determining sort rates for manual sorting. The prime purpose of MODAPTS is to determine the time it will take to complete a given task when working at standard pace (Standard Performance). Standard performance is the rate of output which qualified workers will naturally achieve without overexertion, as an average over the working day or shift, provided they adhere to the specified method and they are motivated to apply themselves to their work.(Heyde et al, from International Labour Office).

Under the MODAPTS methodology, a rest allowance of 10-12 percent for personal needs and fatigue is provided, while Australia Post follows the International Labour Organisation convention of a 15 percent allowance for normal fatigue, personal time and task break activity. This percentage has been used in previous reports. All 'Micropause' activity, allowing blood circulation through muscles, is included in task timings.

MODAPTS can be used to provide an expectant time frame for the bundling and recognising a depot point using a series of movements, reads and decisions. The code refers to the movement (or mental process) that occurs with the specific activity which is typically self-explanatory i.e. all "gets" and "puts" have a movement associated with them.

For reference, "move" movements are determined by distance and joints moved. See Table 2 below.

Table 2 Examples of MODAPTS moves in Bundling and Mail delivery study

M Move	Distance hand or finger is displaced	Example
M1	25mm	Flicking action with fingers when grasping mail in tray
M2	50mm	Turning the bundle around to place second elastic band
M3	75-250mm	Placing mail from SM and RM into left hand for delivery
M4	250-400mm	Locating back 3 bundles for tray bundling

M5	450mm	Opening side satchel to get letter.
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Table 3 Summary of MODAPTS terms recorded in this study

MOD code	Example
P0	Putting a bundle of mail into a hand
P2	Putting a bundle of mail into tray
G3	Picking up a letter from a bundle
Join or separate	Placing an elastic band around an item. This includes picking up the elastic band
E2	Fixate eyes to new location.
R3	Read a 3 digit number or a single word.
D3	Decide whether bundle has a DP (Yes or no decision only)

3. Methodology

Karmel Bartolich met with David Nelson and Debby Freeman on Monday 15th March 2010 to describe the scope of the MODAPTS assessment. The ergonomist (Karmel Bartolich) was provided with a comprehensive risk assessment and SOP for bundling and mail delivery as well as any previous MODAPTS assessment. The scope was to review the current MODAPTS assessment.

To assist with the direction of the study a second meeting at APHQ was arranged with Debby Freeman and John Armitage on Monday 3rd of May 2010. The scope of study was clarified. For example, sequenced mail tray handling for bundling was not included in this study. Also the bunching and folding of mail at the delivery point was not part of the assessment. It was ascertained that video footage was required demonstrating the correct procedure.

A SBD carrier was provided with dummy mail to assist with the MODAPTS study. New video footage was provided in May 2010 using SOP bundling and mail delivery. The video included a "bird's eye" view of delivery using an experienced Postal Delivery Officer (recorded by John Armitage). Additionally there was more video footage of the bundling operation using 2 trays of sequenced mail by a Male PDO (above average height) and also a female PDO (who was closer to the average height). The movements involved in the process were recorded. The final MODAPTS assessment was an interpolation of the typical bundling operation, not necessarily based on a particular PDO. For example, there were only 6 bundles (rather than 7) used for three out of the four trays yet the MODAPTS assessment has the 7 bundles as that is the expectation of the PDO.

The two population types used in the video were, average height and above average height PDO's.

The Ergonomist, Karmel Bartolich then reviewed the previous MODAPTS assessment of the bundling and mail delivery methods.

MODAPTS assessments were conducted on:

- 1) Bundling a tray of sequenced mail using 2 Elastic bands (ref: Table 7)
- 2) Bundling a tray of sequenced mail using 2 Elastic bands and placing the bundle vertically in the tray (ref: Table 7)
- 3) Mail delivery using SBD method (ref: Table 9)
- 4) Traditional mail delivery (ref: Table 14)
- 5) Replenishing Sequenced Mail bundles (ref: Table 18)
- 6) Replenishing Residue Mail bundles (ref: Table 19)
- 7) Replenishing Current bundles - current process for replenishing mail. (ref: Table 17)

This was completed by analysing the May and July 2010 video footage and recording these movements into the MODAPTS program. This was then compared to previous internal MODAPTS assessments. Where applicable, terms were recognised and adopted.

4. Results

4.1 Bundling

To assist with the study the following items were reviewed:

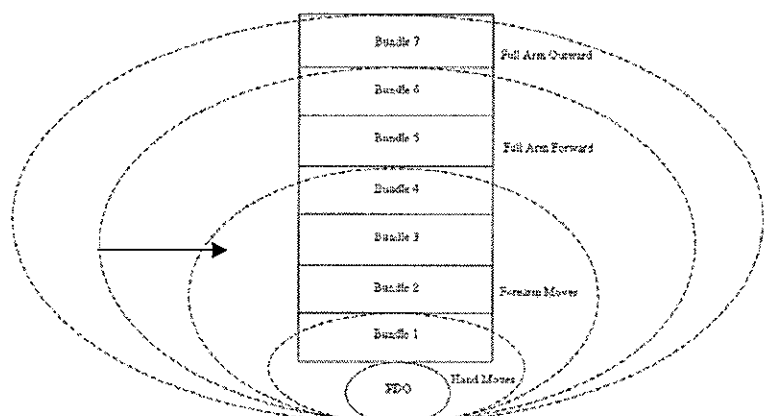
- Footage of 2 band bundling of sequenced mail
- April 2010 Video of bundling 2 elastic bands –no depot point checking 2 trays
- May 2010 Video of bundling 2 elastic bands and depot checking.
- Initial MODAPTS assessment of bundling with variants
- SBD indoor training Picture Process Maps
- Risk Assessment & SOP

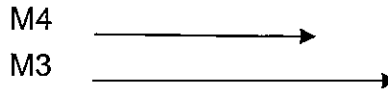
The following observations and MODAPTS assessment is based on the video taken in May 2010.

Observations.

Tray division into M3, M4 and M5 moves clarified the reaches used in the MODAPTS study. The initial reach is also a M3 rather than a M2.

M5

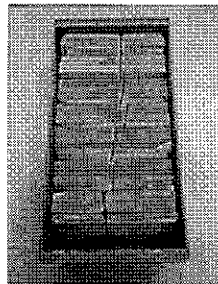




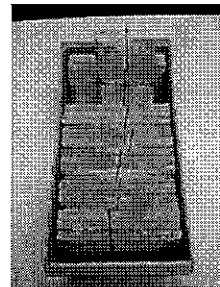
Two PDO's were observed in the footage (an above average height male PDO and an average height female PDO) using the following bundling method.

- 1) Bundling with 2 rubber bands
 - 2) Bundling with 2 rubber bands with depot point returned to tray in upright position.
- (Refer to pictures below)

Tray of sequenced mail, bundled.



Tray of sequenced mail, bundled with Depot Point identified.



The table below shows some of the extra moves that are not captured by the MODAPTS assessment. The time cost of the movements is low and the extra moves are typically different for each person who does the bundling task. Extra finger movements in grasping amounted to 1-2 MODs. This has been noted but omitted from the MODAPTS assessment as it imposes a low time cost and is varied across users.

Table 4 Breakdown of actions from May 2010 video for tray bundling ABOVE AVERAGE HEIGHT PDO

Tray No depot	1	2	3	4	5	6	7
1 st tray	No extra moves	No extra moves	No extra moves with grasp	Grasp and tap M1P0 Regrasp of elastic	Right hand shifts pile back and left hand finger move and taps whole bundle	Grasps bundle then finger taps x 2	No bundle
Tray with depot	1	2	3	4*	5	6	7
2 nd tray	Finger tapping with grasp x3	Regrasp M2P2	Fingers tapping with grasp x 3	No extra moves Inverts bundle	No extra moves	Right hand shifts pile back. Left hand finger	No bundle

						taps with grasp	
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Table 4a Breakdown of actions from May video for tray bundling AVERAGE HEIGHT PDO

Tray No depot	1	2	3	4	5	6	7
1 st tray	Finger taps M1 P0 while grasping x2	No extra moves	Finger taps M1 P0 while grasping x1	Finger taps with grasp M1P0 x 3 Push in pile	No extra moves in grasp. Extra push in	Grasps bundle then regrasp to leave out letters	No extra moves
Tray with depot	1	2	3	4	5*	6	7
2 nd tray	Opens hand out as a separate move	Finger taps in extra letters M1G0M1P0	Finger taps in extra letters M1G0M1P0	Finger taps in extra letters M1G0M1P0	No extra moves. Turned on side	Finger taps in extra letters M1G0M1P0	No Bundle

Table 6 The actual timing for bundling from the video is below.

PDO	No depot	Bundles	With Depot	Bundles
Male	42sec	6	35sec	6
Female	75sec	7	70sec	6

Male PDO opens his fingers out and with one movement the elastic band is around the bundle. It is quite efficient. The female method is different as the elastic band gets stuck and there is a lot of 2 handed action to encircle the bundle. This should all be captured in E30.

The nature of mail in the tray is to fall when there is gap in front of the mail. There are extra moves to stand the mail upright so that the bundles can be inserted behind. This is dependent on amount of mail in tray. The Male PDO corrected this fallen mail once on each tray.

It is interesting to note that the male PDO and one of the trays of the female PDO used only 6 bundles per tray. The time consuming part is the elastic band. Having less bundles means that bundling becomes more efficient.

Depot Points (DP) are assumed to be known by the PDO if familiar with the round. The PDO typically checks the address at the start of the bundle to determine if they are before the depot point or after it. The bundle with the depot point was simply turned to its vertical side. There was no added moves for MODAPTS. There was just an extra decision that the DP was in that particular bundle and the bundle. In reality, not every tray has a delivery point.

Less extra moves for bundles with uniform height mail, larger letters (A5) encourage re-grasping. Longest time delay is picking up elastic bands with right hand (this is included in Elastic Band S30).

Table 7 contains a breakdown of 3 scenarios. The first part contains the standard MODAPTS assessment for bundling of mail. This is when the tray is full and there is no falling of mail. What typically occurs is that letters will fall back within the tray when a bundle is removed, most likely towards the end of the tray. This extra movement occurs frequently but not on every tray observed in the video and thus is separated. When a DP has to be noted, the only observed change in MODAPTS is the decision to place a bundle sideways in the tray. The actual movement of the bundle of movement sideways is the same as putting the bundle in the correct position, therefore the only extra movement is the decision.

Table 7 MODAPTS assessment of bundling tray of mail using 2 rubber bands

(Reference May 2010 video, interpolation of video results)

No	Item	Description	Left	Right	Freq	Mod
1	Get and Put	Pick up 1,2,3,4 bundle and bring to waist	M3 G3 M3P0		4	36
2	Read Join or	Check address for DP		R2	4	8
3	Separate	Place first elastic band to envelope		JS30	4	120
4	Put Join or	Place bundle into left hand at a right angle		M2 P0	4	8
5	Separate	Place 2nd elastic band on bundle		JS30	4	120
6	Put	Put bundle in tray	M3 P2 M4 G3		4	20
7	Get and Put	Pick up 5,6 bundle and bring to waist	M4P0		2	22
8	Read Join or	Check address for DP		R2	2	4
9	Separate	Place first elastic band to envelope		JS30	2	60
10	Put Join or	Place bundle into left hand at a right angle		M2 P0	2	4
11	Separate	Place 2nd elastic band on bundle		JS30	2	60
12	Put	Put bundle in tray	M4 P2 M5 G3		2	12
13	Get and Put	Pick up 7th bundle and bring to waist	M4P0		1	12
14	Read Join or	Check address for DP		R2	1	2
15	Separate	Place elastic band to envelope		JS30	1	30

16	Put Join or	Place bundle into left hand at a right angle	M2 P0	1	2
17	Separate	Place 2nd elastic band on bundle	JS30	1	30
18	Put	Put bundle in tray	M5 P2	1	7
		Seconds	Mod		
	No rest	71.9	557		
	Rest	82.7			

Add Decision when finding DP

19	Decide	Decide that DP is in this bundle	D3	1	3
		Seconds	Mod		
	No rest	72.2	560		
	Rest	83.1			

Picking up mail

20	Get and Put	pick up mail which has fallen	M4 G3 M2P0	1	9
		Seconds	Mod		
	No rest	73.4	566		
	Rest	84.4			

Picking up mail and decision

(19)	Decide	Decide that DP is in this bundle	D3	1	3
(20)	Get and Put	pick up mail which has fallen	M4 G3 M2P0	1	9
		Seconds	Mod		
	No rest	73.4	569		
	Rest	84.4			

Table 8 Bundling of sequenced mail with estimated times in MOD and seconds (including rest)

	1 tray MOD (sec with rest)	2 tray MOD (sec with rest)	3 tray MOD (sec with rest)	4 trays MOD (sec with rest)	5 trays MOD (sec with rest)
7 bundles	557(82.7)	1114(165.3)	1671 (247.9)	2228 (367.2)	2785 (413.2)
7 bundles with DP	560 (83.1)	1120 (166.2)	1680 (249.2)	2240 (332.3)	2800 (415.4)
7 bundles with pick up	566 (84)	1132 (168)	1698 (252)	2264 (336)	2830 (420)
7 bundles with DP and pick up	569 (84.4)	1138(168.8)	1707 (253.2)	2276 (337.6)	2845 (422.1)

4.2 Mail delivery of SM and RM by Motorcycle

To assist with the study the following items were reviewed.

- Initial video of Motorcycle SBD
- More recent video including a birds eye view of SBD on a Honda CT110 motorcycle
- MODAPTS assessment
- SBD Delivery Training Picture Process Maps
- Risk Assessment & SOP's SBD motorcycle

Observations

When removing a letter from the RM area of the carrier, it typically took a little longer to remove on most occasions especially if larger letters. This was observed to be because the address was not obvious or because the mail was set into the carrier and needed extra moves to get it out. If the recommended bundle size is followed, residue mail should not stick. However, it should also be noted, that even if retrieval of the initial first couple of letters is restricted, then this would be negated when the residue bundle of mail reduces during delivery, so there should be less restriction.

Comments

- Some of the previous MODAPTS used G1 instead of G3 to collect mail whilst delivering.
- The previous MODAPTS assessment did not use simultaneous moves such as gets and puts for each hand but rather put them as separate steps ie put into left hand and left hand gets. In practice they occur at the same time.
- The previous MODAPTS assessment had a sequence of Eye use, Read and Decision for both SM and RM. This appears correct.
- The extra moves such as shuffling, bunching or folding together before being placed into the mailbox have been noted but not included in this MODAPTS assessment. It does not affect the separate bundle delivery specifically (and, as such, is outside the scope of this assessment) but rather is part of the mail delivery process.
- There was some simultaneous moves such as while the left hand was delivering the right hand was starting to sort through the next delivery point.
- Placement of sequence mail is easy to access and the PDO has good eye vision. The head is relatively upright.

Table 9 Operation: SBD Typical sample of Mail delivery on Motorbike

(based on interpolation of MODAPTS assessment from May 2010 video)

Remark 2 SM letters, 1 RM and 1 UM

Number	Item	Description	Left	Right	Freq	Mod
1	Eye Use	Focus on address of facing letter in SM		E2	1	2
2	Read	Read number of delivery point in SM		R3	1	3
	*Get and					
4	Put	Pick up initial SM letter and place in LH		M3 G3 M3P0	1	9
5	*Get	Left hand receives letter	M2 G1			
6	Read	Read number of delivery point in SM		R3	1	3
	*Get and	Pick up second SM letter and place in hand				
7	Put			M3 G3 M3P0	1	9
8	*Get	Left hand receives letter	M2 G1			
9	Read	Read number of delivery point in SM		R3	1	3
10	Decide	Decide no more SM mail go to RM		D3	1	3
11	Eye Use	Focus on address of facing letter in RM		E2	1	2
12	Read	Read number of delivery point in RM		R3	1	3
13	Get and Put	Pick up initial RM letter and slide out		M3 G3 M2P0	1	8
14	*Put	place RM into Left hand		M3 P0	1	3
15	*Get	Left hand receives letter	M2 G0			
16	Read	Read number of delivery point in RM		R3	1	3
17	Decide	Decide no more RM letters		D3	1	3
	*Get and					
18	Put	Pick up UM and place in LH		M3 G3 M3P0	1	9
19	*Get	left hand receives UM	M2 G1			
		Seconds		MODS		
	No rest	8.1		63		
	Rest	9.3				

Table 10 Extra SM

Number	Item	Description	Left	Right	Freq	Mod
1	Read	Read number of delivery point in SM		R3	1	3
	*Get and					
2	Put	Pick up SM letter and place in hand		M3 G3 M3P0	1	9
3	*Get	Left hand receives letter	M2 G1			
		Seconds		MODS		
	No rest	1.5		12		
	Rest	1.72				

Table 11 Extra RM

Number	Item	Description	Left	Right	Freq	Mod
1	Read	Read number of delivery point in RM		R3	1	3
2	Get and Put	Pick up initial RM letter and slide out		M3 G3 M2P0	1	8
3	*Put	place RM into Left hand		M3 P0	1	3
4	*Get	Left hand receives letter	M2 G0			
		Seconds		MODS		

No rest	1.8	14
Rest	2.1	

Table 12 Extra UM

Number	Item	Description	Left	Right	Freq	Mod
1	*Get and Put	Pick up UM and place in LH		M3 G3 M3P0	1	9
2	*Get	left hand receives UM	M2 G1			
		Seconds	MODS			
	No rest	1.2	9			
	Rest	1.4				

Table 13 Delivery table with estimated times in MOD and seconds (including rest)

	0 x Sequenced Mail	1 x Sequenced Mail	2 x Sequenced Mail	3 x Sequenced Mail	4 x Sequenced Mail
0 x Residue Mail		28 (4.2sec)	40 (6.0sec)	52 (7.8sec)	64 (9.5sec)
1 X Residue Mail	27 (4.1sec)	42 (6.3sec)	54 (8.2sec)	66 (9.8sec)	78 (11.6sec)
2 x Residue Mail	41 (6.1sec)	56 (8.4sec)	68 (10.2sec)	80 (11.9sec)	92 (13.7sec)
3 x Residue Mail	55 (8.2sec)	70 (10.4)	82 (12.2)	94 (14.0sec)	106 (15.8sec)
4 x Residue Mail	69 (10.3)	84 (12.5sec)	96 (14.3)	108 (16.1sec)	119 (17.8sec)

4.3 Traditional Mail delivery by Motorcycle

To assist with the study the following items were reviewed.

- Initial video of Motorcycle delivery
- More recent video including birds eye view of Motorcycle delivery
- Previous MODAPTS assessment
- SBD Delivery Training Picture Process Maps
- Risk Assessment & SOP's SBD motorcycle

Observations

On observation of the video footage of traditional mail delivery, there were different techniques in getting the mail into the hand from the mail bag. The mail was flicked while in the carrier and then picked up by either the right or left hand or each letter was handed into the left hand by the right hand.

Table 14 Operation: TRADITIONAL: Typical sample of Mail delivery on Motorbike

(based on interpolation of MODAPTS assessment from May 2010 video)

Remark 3 letters (includes large letters and standard mail) and 1 UM

Number	Item	Description	Left	Right	Freq	Mod
		Focus on address of facing letter in				
1	Eye Use	Traditional mail bag		E2	1	2
2	Read	Read number of delivery point		R3	1	3
	*Get and					
3	Put	Pick up initial letter and place in LH		M3 G3 M3P0	1	9
4	*Get	Left hand receives letter	M2 G1			
5	Read	Read number of delivery point		R3	1	3
	*Get and					
6	Put	Pick up second letter and place in left hand		M3 G3 M3P0	1	9
7	*Get	Left hand receives letter	M2 G1			
8	Read	Read number of delivery point		R3	1	3
9	Get and Put	Pick up third letter and place in left hand		M3 G3 M3P0	1	9
10	*Get	Left hand receives letter	M2 G0			
11	Read	Read number of delivery point in RM		R3	1	3
12	Decide	Decide no more mail to that delivery point		D3	1	3
	*Get and					
13	Put	Pick up UM and place in left hand		M3 G3 M3P0	1	9
14	*Get	Left hand receives UM	M2 G1			
		Seconds		MODS		
	No rest	6.8		53		
	Rest	7.9				

Table 15 TRADITIONAL Extra letter

Number	Item	Description	Left	Right	Freq	Mod
1	Read	Read number of delivery point		R3	1	3
	*Get and					
2	Put	Pick up letter and place in hand		M3 G3 M3P0	1	9
3	*Get	Left hand receives letter	M2 G1			
		Seconds		MODS		
	No rest	1.5		12		
	Rest	1.8				

Extra UM (See table 12)

Table 16 Delivery table for Traditional bags with estimated times in MOD and seconds (including rest)

Number of letters delivered	MODs	Seconds (with rest)
0 mail	8	1.2
1 letter	20	3
2 letters	32	4.7
3 letters	44	6.5
4 letters	56	8.3
5 letters	68	10.1
6 letters	79	11.7
7 letters	91	13.5

4.4 Replenishment of current mail versus SBD (Motorcycle)

To assist with the study the following items were reviewed.

- July 2010 video of replenishment of mail
- May 2010 video including birds eye view Motorcycle mode
- SBD Delivery Training Picture Process Maps
- Risk Assessment & SOP's SBD MC

Observations:

- All replenishment of mail involved opening up a satchel to remove the bundle.
- Traditional replenishment of mail involves removing 2 elastic bands from larger bundles of mail which includes sequence and residue mail together. The traditional mail bag is not sectioned and the movement of the bundle into the bag is relatively easy.
- SBD requires the replenishment of both sequenced mail and residue mail. It is assumed that there will be a far greater number of sequenced mail bundles that need to be replenished than residue mail bundles. The smaller bundle of sequenced mail is very

efficient to replace as the bundle can be grasped with one hand and the carrier is easy to access. The bundle is fastened with elastic bands which are placed into the carrier storage pocket once removed.

- MODAPT’s assessment includes the “unfastening” of the elastic band includes the putting down of elastic bands as part of the total movement.
- The residue mail bundle required more time to replenish due to the position of the mail (under the sequence mail section) and more importantly the removal of the strap and consequential folding of the Hook and Loop strap for storage.
- For the putting away of the Hook and Loop strap there were 2 different methods in folding the strap back, one using a hand movement to secure the Hook and Loop and the other a thumb movement. The hand movement was used in the MODAPTS assessment.
- Return of hands onto handle bars was not included in the MODAPTS assessment. Final movement was placing the strap back into the satchel.

Table 17 Operation: Current Replenish mail (includes small and large letters -2 elastic bands)

Number	Item	Description	Left	Right	Freq	Mod
1	Decide	Need to replenish mail bundle		D3	1	3
	*Get and			M5 G1		
2	Put	Lift flap of satchel		M3P0	1	9
3	*Get	hold cover of satchel	M3 G1			
	Get and			M4 G3		
4	Put	pick up bundle and slide out of bag		M2P0	1	9
5	Put	Put bundle to left hand in front of carrier		M5 P2	1	7
	Join or	remove elastic bands and place into				
6	Separate	orange carrier		JS12	2	24
7	Get	Left hand moves to left hand side after dropping off last elastic band	M2G1		1	3
8	Get	Right hand moves from top of bundle to right hand side.		M2G1	1	3
9	*Put	Put bundle into opening of orange carrier	M3 P5		1	8
10	*Put			M3 P5		
	Get and	Place right hand on edge of orange carrier		M3G1		
11	Put	and move out to make more space		M2P0	1	6
12	Put	Left hand inserts bundle into orange carrier	M2 P2		1	4
	Get and	Move left hand to middle of bundle and				
13	put	provide extra push with left hand to insert bundle	M2G0M2P0		1	4
		Seconds	MODS			80
	No rest	10.32				
	With rest	11.9				

Table 18 Operation: Replenish SM mail (includes only small letters- 2 elastic bands)

Number	Item	Description	Left	Right	Freq	Mod
1	Decide	Need to replenish SM mail		D3	1	3
	*Get and		M5 G1			
2	Put	Lift flap of satchel	M3P0		1	9
3	*Get	hold cover of satchel		M3 G1		
	Get and		M4 G3			
4	Put	pick up bundle and bring to bag	M5P0		1	12
	Join or	remove elastic bands no change of hand				
5	Separate	movement		JS12	2	24
6	*Put	insert bundle into SM area of carrier	M3 P5		1	8
	*Get and					
7	put	Pull back see through plastic front edge		M2G1M2P0		
		Seconds	MODS			56
	No rest	7.2				
	With rest	8.3				

Table 19 Operation: Replenish RM (includes large and small letters-Hook and Loop straps)

No.	Item	Description	Left	Right	Freq	Mod
1	Decide	Need to replenish RM mail		D3	1	3
	*Get and					
2	Put	Lift flap of satchel		M5 G1 M3P0	1	9
3	*Get	hold cover of satchel	M3 G1			
4	Get and Put	pick up bundle and slide out of bag		M4 G3 M2P0	1	9
5	*Put	Put bundle to SBD carrier		M5 P0	1	5
6	*Get	Left hand grabs bundle	M2G1			
7	Get	Right hand changes grasp to front of bundle		M2G1	1	3
8	*Put	Places bundle into carrier		M2P5	1	7
9	*Get and put	Pulls down front of carrier	M3G1M2P0		1	
10	Put	Slides bundle into slot		M2 P0	1	2
11	Extra Force	force bundle into position		X4	2	8
12	Get and put	Place hand on top of bundle push down		M2G0 M2 P0	1	4
	*Get and	Pick up ring Hook and Loop strap and pull up				
13	Put	(stage 1)		M2 G3 M2P0	1	7
14	*Get	Left hand presses down letters	M2G1			
15	Put	Adjust hand and pull up end (stage 2)		M2P0	1	2
16	Extra Force	While pulling strap up		X4	1	4
17	Put	pull strap forward through ring (stage 3)		M4P0	1	4
18	Extra force	To pull strap out		X4	1	4
19	Get	Get end of strap and place into position on lap	M3 G3 M3P0		1	9
20	Get	Get to end of other end of strap		M2G3	1	5
		Place end of Hook and Loop strap matching				
21	Put	other end		M3P5	1	8
22	Put	Left thumb holds down strap	M1P0			1
		Slide thumb across to match Hook and Loop				
23	Get and Put	strap		M2G3M3P2	1	10
24	Get and Put	Press Velcro using hand		M3G1M2P2		8
25	Get and Put	lift flap of side bag	M5 G1 M3P0		1	9
26	Put	place into pouch		M4 P2	1	6

	Seconds	MODS
No rest	16.4	
Rest	18.8	

Table 20 Comparison of actual time from video and MODAPTS assessment

July replenishment video	Current method	Sequence mail	Residue mail (observed x2)
Actual time in video	12 secs	8 sec	18sec and 22 sec
MODAPTS	80MOD	56MOD	127MOD
Time (including rest)	11.9sec	8.3sec	18.8sec

5. Discussion

Bundling

There were extra moves observed in the video. These included finger flicks (described as taps) while selecting the mail and re-grasping i.e. changing the finger position on the bundle before raising it. These smaller moves are not consistent with each grasp and are considered part of the G3. Towards the end of the tray with the nature of the mail to fall, there was an extra move of standing up fallen mail. I believe this move should be included as it does on two occasions of the 4 videos for bundling.

The depot point identification is just a decision and a turning of the bundle. This turning does not cost anything in movement. The assumption is that each bundle is read before the elastic band is attached.

The J30 for elastic bands was checked using MODAPTS using a step by step methodology. The element does not include picking up the letters or putting down the letters. It does include picking up the elastic band etc. The task of placing the elastic band around the bundle was broken down into MODAPTS steps. This was within the 30 MOD allocation for placing an elastic band around the bundle.

Separate Bundle Delivery (Motorcycle)

With the new separate bundle delivery bag, the head is in a better posture i.e. more upright position to look at the sequenced mail. It is within a 30 degree angle, which is an ergonomically acceptable position for viewing.

In looking at the video of mail delivery, the retrieval of mail and placing it into the left hand is efficient and quick. The expanded time cost appears to be factors which are part of normal delivery. These factors are;

- Not being able to read addresses and having to tear down edge of the envelope to read the address, occurs throughout the delivery process.
- Whether the motorcycle parks to the side of the delivery point or front on (3 point turn required),
- Folding large letters or aiming for a narrow aperture.

These will improve efficiencies in mail delivery but are outside the scope of this study.

There are quite a few decisions in the mail collection e.g. run out of SM decide to look in RM, run out of RM and go to UM. In reality, the action is more or less automatic.

OHS implications

The musculoskeletal potential issues pertaining to SBD is the pronated hand position and limited space when retrieving mail from the residue mail compartment, to be specific the initial letters of a larger bundle. In retrieving this mail, the hand is not in an end of range position and there may be some added force in getting the letter out i.e. finger extensors/flexors. The back of the hand may also be in contact with the bag during the retrieval.

6. Conclusion

In conclusion, the time to bundle a tray of sequenced mail including a depot point decision and picking up mail which has fallen over in the tray is 84.4 seconds (refer to table 1).

The time required for removing mail from SM, RM and UM sections of the front letter carrier whilst delivering the mail is dependent on the number of mail articles from each section (Tables 9, 10, 11 & 12 provide MODAPTS assessments for SM and RM mail). Sequenced mail is most efficient as the bundle can be held in one hand.

In comparison to traditional mail delivery, the SBD method of delivery is only marginally more time consuming due to the extra reads and decisions from looking at both sections of the mail bag. While it takes slightly longer to retrieve mail from the Residue mail section of the bag (as opposed to the sequenced mail or the traditional mail bag where the mail is easily accessible),

there does not appear to be any added postural hazard from using the SBD carrier; in fact the head posture is improved due to the position of the SM mail.

7. References

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MODAPTS Assessment of Separate Bundle Delivery Process

GLOSSARY OF TERMS

- SBD: Separate Bundle Delivery
- RM: Residue Mail
- SM: Sequenced mail
- UM: Unaddressed Mail
- DP: Depot Point
- PDO: Postal Delivery Officer
- SBD MC Separate Bundle Delivery motorcycle front letter carrier

